School of Public Health

A Mixed-Methods Investigation of Australian Supermarkets' Corporate Social Responsibility Commitments to Public Health: The Case of Supermarket Own Brand Foods

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Human Ethics

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number RDHS-186-15.

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Abstract

Globally, poor diet is a leading risk factor for noncommunicable diseases including obesity. In response, governments prepare food-based dietary guidelines such as the Australian Dietary Guidelines, yet few Australians eat according to the recommendations. In Australia, nutrient-poor discretionary foods provides 35 percent of the total energy consumed, and highly processed, or ultra-processed, foods are widely prevalent in the food supply. The influences on population diets include food environments as well as individual factors. Supermarket consumer nutrition environments (i.e. the within-store food environment that consumers encounter when selecting and purchasing food) can influence poor dietary patterns by the products available, their price, promotional activity, and shelf location.

Supermarkets have been described as the gatekeepers of the food supply, and exert significant influence over consumer nutrition environments. Supermarket own brand foods (or private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers and sold privately in their own stores. By introducing supermarket own brand foods, their power has extended beyond retail into manufacture. Supermarkets have assumed a food governance role within the food system, whereby they set private standards for suppliers, and implement voluntary corporate social responsibility (CSR) commitments to address consumer concerns and minimise their impact on society.

The aim of this research was to examine Australian supermarkets' CSR commitments that impact public health, and evidence of practical application, by analysing the contribution of supermarket own brand foods to Australian consumer nutrition environments. A multistage mixed-methods approach was adopted to gain breadth and depth of the research topic because so little was known. The methods included two scoping reviews, packaging audits, focus groups, photographic audits of supermarket own brand foods, and content analysis of supermarket policies that can impact public health. Eight studies were conducted to meet the research aim.

Study one, a systematic scoping review, summarised peer-reviewed Australian studies that have examined consumer nutrition environments; identified knowledge gaps; and provided recommendations for future research. As this is an emerging field of research

in Australia, the review summarised which domains of the consumer nutrition environment (i.e. product, price, placement, promotion) have been examined and the approaches used, rather than what was found. A large number of knowledge gaps were identified and recommendations for research priorities were made. A key finding was that little is known about the contribution of supermarket own brand foods to consumer nutrition environments in Australia.

Study two, a systematic scoping review, synthesised the peer-reviewed and grey literature that described the position supermarkets occupy in the Australian food system; identified gaps in knowledge; made recommendations for further research; and identified the implications for public health. Supermarkets were found to hold a powerful position in Australian food system, acting as the primary gatekeepers. Few positive public health impacts of supermarket power were identified, providing many opportunities for improvement in the domains of food governance, the food system and public health nutrition. The scoping review revealed supermarket own brand foods have a pivotal role as a source of supermarket power and impact on public health.

Study three evaluated the voluntary nutrition and health information present on packaging of high-market-share ultra-processed foods (UPF) for their potential impact on public health. The NOVA system classifies foods based on the extent of food processing not nutrient content, and identifies UPF as foods to avoid. Data were collected from the labels of 215 packaged foods from five high-market-share manufacturers and one supermarket own brand. Most UPF packaging featured nutrition and health statements or claims, and the most commonly used were nutrition claims (56%), health claims (25%), and food marketing techniques (97%). UPF in this study were attractively packaged with multiple nutrition and health messages present, despite being rated a less healthy choice.

Study four investigated parents' ability to navigate common within-store marketing techniques to select healthy foods. Five 90-minute focus groups were conducted by an experienced facilitator in Perth, Western Australia. Thirty-seven parents of children aged 2-8 years discussed who they thought was responsible for helping them to select healthy foods in supermarkets. Seven themes were identified: (1) pressure of meeting multiple demands; (2) desire to speed up shopping; (3) feeding them well versus keeping them happy; (4) lack of certainty in packaging information; (5) government is

trusted and should take charge; (6) food manufacturers' health messages are not trusted; and (7) supermarkets should assist parents to select healthy foods. Food packaging information appeared to be contributing to parents' uncertainty over healthy food choices, suggesting an information overload. Supermarkets were trusted by parents, and could assist them by taking a structural approach to CSR, providing shopping environments that support and encourage healthy food choices.

Study five documented the protocol developed for a photographic audit of all supermarket own brand foods present in three large exemplar supermarkets in Perth, Western Australia. The supermarket audits examined the availability, nutritional quality, price, placement and promotion of supermarket own brand foods in Australia. Approximately 20,000 photographic images were collected for 3940 supermarket own brand foods: 1812 in the Woolworths store, 1731 in the Coles store, and 397 in the IGA store. Data extracted from the photographs included: front-of-pack information, packaging and label design attributes, shelf-edge label price and promotion information, placement and prominence of each product, and nutrition and health information. Nutritional quality was also assessed. A database of supermarket own brand food marketing practices was constructed, and audit data were used in studies six and eight.

Study six examined alignment between front-of-pack nutrition labels on supermarket own brand foods and measures of nutritional quality. Findings from the supermarket audits were used to respond to a policy-relevant question, demonstrating the utility of the data. Half (51%) of the foods were classified as nutritious according to the principles of the Australian Guide to Healthy Eating, but 57% were classified as nutrient-poor UPF using the NOVA level of food processing. The two voluntary nutrition labels present in Australia, government-led Health Star Ratings (HSR) and food industry-led Daily Intake Guide, were present on most (81.5%) supermarket own brand foods. Nutrient-poor and UPF were more likely than nutritious foods to include the HSR, and many of these foods achieved a score that incorrectly implied they were a healthy choice.

Study seven investigated the world's largest and most powerful supermarkets' publicly available CSR commitments to determine their potential impact on public health. Thirty-one supermarkets that published corporate reports referring to CSR or

sustainability, in English, between 2013 and 2018, were included and the content was thematically analysed. Some CSR commitments from some global supermarkets indicated they have the potential to positively impact public health, but in general they were disappointing. Most global supermarket CSR commitments related to sustainability, including reducing food waste, protecting animal welfare, and ethically sourcing ingredients such as palm oil. Little action was being taken to support health and nutrition.

Finally, study eight examined Australian supermarkets' CSR commitments which can impact public health nutrition and evidence of practical application. Content analysis of publicly available CSR commitments relating to public health nutrition was conducted. Evidence of supermarkets putting CSR commitments into practice was derived from the photographic audits of 3940 supermarket own brand foods. Over half of Australian supermarket CSR commitments related to sustainability, and few addressed accessibility, availability, or affordability of nutritious supermarket own brand foods. All supermarkets sold nutritious supermarket own brand foods and used marketing techniques which made them highly visible. Half of the supermarket CSR commitments lacked specificity. These findings suggest Australian supermarket CSR committments are not likely to adequately contribute to improving population diets or sustainability of food systems.

The research findings show how Australian supermarkets exert power over the food system and impact public health by the decisions they make. Consumers depend on supermarket CSR commitments to support public health, however few CSR commitments related to availability, accessibility, or affordability of nutritious foods, which are fundamental requirements of healthy and sustainable population diets. A number of supermarket own brand marketing practices were of concern for public health, and there are numerous opportunities for supermarkets to improve their impact on Australian consumer nutrition environments. Focus group findings indicate that supermarket action would be accepted by consumers. Key recommendations for further public health research, policy and practice include investigating the drivers of supermarket decision-making that can impact public health nutrition, and analysing supermarket 'corporate political activity', which is undertaken with the aim of influencing political outcomes that can impact public health, to understand the policy implications.

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This thesis includes six published studies, and I would like to thank all of the peer-reviewers for their time and feedback, which assisted in strengthening the work presented.

Thanks also to the thirty-nine focus group participants for sharing their food shopping experiences.

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Publications included as part of the thesis

For each of the peer-reviewed publications included in this PhD thesis, I contributed to conceptualising the scope, design and research objectives, and conducted data collection, data analysis, interpretation of findings, and prepared drafts of the manuscripts.

The following publications are included as part of this thesis:

1. **Pulker CE**, Thornton LE, Trapp GSA. What is known about consumer nutrition environments in Australia? A scoping review of the literature. *Obes Sci Pract.* 2018; 4: 318-37.

2. **Pulker CE**, Trapp GSA, Scott JA, Pollard CM. What are the position and power of supermarkets in the Australian food system, and the implications for public health? A systematic scoping review. *Obes Rev.* 2018; 19: 198-218.

3. **Pulker CE**, Trapp GSA, Foulkes-Taylor F, Scott JA, Pollard CM. The extent and nature of supermarket own brand foods in Australia: study protocol for describing the contribution of selected products to the healthfulness of food environments. *Nutr J*. 2018; 17: 95.

4. **Pulker CE**, Scott JA, Pollard CM. Ultra-processed family foods in Australia: nutrition claims, health claims and marketing techniques. *Public Health Nutr.* 2018; 21: 38-48.

5. **Pulker CE**, Trapp GSA, Scott JA, Pollard CM. Alignment of supermarket own brand foods' front-of-pack nutrition labelling with measures of nutritional quality: An Australian perspective. *Nutrients*. 2018; 10: 1465.

6. **Pulker CE**, Trapp GSA, Scott JA, Pollard CM. Global supermarkets' corporate social responsibility commitments to public health: a content analysis. *Globalization and Health.* 2018; 14: 121.

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Manuscripts included in this PhD thesis which have been submitted for publication include:

7. **Pulker CE**, Ching Li DC, Scott JA, Pollard CM. Who should help customers to select healthy foods in supermarkets? A qualitative study of Australian parental views. **Under review**.

8. **Pulker CE**, Trapp GSA, Scott JA, Pollard CM. The nature and quality of Australian supermarkets' policies which can impact public health nutrition and evidence of practical application: a cross-sectional study. **Under review.**

Presentations related to the thesis

International conferences:

1. **Pulker C**, Thornton L, Trapp G. What is known about consumer nutrition environments in Australia? The Nutrition Society Irish Section Conference: What governs what we eat? Belfast, 21-23 June 2017 (presenter).

   Abstract: **Pulker CE**, Thornton L, Trapp G. What is known about consumer nutrition environments in Australia? *P Nutr Soc.* 2017; 76.

National conferences:

2. **Pulker C**, Trapp G, Scott J, Pollard C. A global comparison of Australian supermarkets' corporate social responsibility commitments to health. Food Futures Conference, Brisbane, 21-22 November 2018 (presenter).

3. **Pulker C**, Pollard C, Booth S, Coveney J, Pennell S, Dixon J. The impact of supermarkets on public health: goals for improvement in Australia. Food Futures Conference, Brisbane, 21-22 November 2018 (workshop presenter).

4. **Pulker C,** Trapp G, Scott J, Pollard C. Powerful supermarkets are gatekeepers of the Australian food system: Implications for health promotion. Australian Health Promotion Association's Health Promotion Symposium, Canberra, 23-24 August 2018 (presenter).

5. **Pulker C**, How can the Health Star Rating algorithm be more aligned to the Australian Dietary Guidelines? Public Health Association of Australia Health Star Rating Forum, Canberra, 27 November 2017 (invited panellist).

6. **Pulker C**, Scott J, Pollard C. Who do parents think is responsible for helping them to select healthy packaged family foods? Food Governance Conference, The University of Sydney, 1-3 November 2016 (presenter).

7. **Pulker C**, Trapp G, Scott J, Pollard C. Corporate social responsibility and health promotion: just what the doctor ordered? A new platform for corporate policy influence and marketing? Australian Health Promotion Association's 23rd National Conference, Perth, 19-22 June 2016 (invited panellist)

Local seminars:

8. **Pulker C**. Supermarket own brand foods: good or bad for public health? Health Sciences Professoriate, Curtin University, 18 October 2018 (invited presenter).

9. **Pulker C**, Trapp G, Scott J, Pollard C. Powerful supermarkets are gatekeepers of the Australian food system: Implications for public health. Mark Liveris Seminar, Curtin University, 27 September 2018 (presenter). *Second Prize for the Best Paper Presentation Award*

10. **Pulker C**, Trapp G, Scott J, Pollard C. Nutrition claims, health claims and marketing techniques on ultra-processed foods in Australia. Mark Liveris Seminar, Curtin University, 28 September 2017 (presenter).

11. **Pulker C**, Trapp G, Scott J, Pollard C. Who do parents think is responsible for helping them to select healthy packaged family foods? Mark Liveris Seminar, Curtin University, 1 September 2016 (presenter).

Statement of the contribution of others

An overview of the contribution of others is given below. Statements of the contributions of others for each publication are provided in Appendix A.

Professor Jane Scott contributed as PhD supervisor. She participated in defining the scope and design of the research, and reviewed drafts of manuscripts and the thesis, suggesting improvements.

Dr Christina Pollard contributed as PhD co-supervisor. She participated in defining the scope and design of the research, provided advice on the design and research objectives for each of the studies contained within this thesis, and reviewed drafts of manuscripts and the thesis, suggesting improvements.

Dr Gina Trapp contributed as PhD associate supervisor. She participated in defining the scope and design of the research, and reviewed drafts of manuscripts and the thesis, suggesting improvements.

Dr Lukar Thornton contributed as co-author for one publication which reviews the Australian consumer nutrition environments literature. He participated in the study design, and reviewed drafts of the manuscript, suggesting improvements.

Ms Frances Foulkes-Taylor contributed as research assistant, providing assistance with the supermarket audits, including data collection and data extraction, and identified the global supermarket corporate social responsibility documents. She was co-author for one publication which described the protocol for the supermarket audits.

Ms Heather Farquhar contributed as a student dietitian, providing assistance with data entry for the supermarket own brand chilled convenience foods' back-of-pack information, and data analysis of their nutritional quality.

Dr Denise Chew Ching Li contributed as a student dietitian, providing assistance with the focus groups, including administration of the groups, and data analysis of the transcripts. She was co-author for one publication which reports the findings of the focus groups.

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List of Abbreviations

ATNI	Access to Nutrition Index
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
AGTHE	Australian Guide to Healthy Eating
Coles	Coles Supermarkets Australia Pty Ltd
CSR	Corporate social responsibility
DIG	Daily Intake Guide
FACS	Food Access and Costs Survey
FSANZ	Food Standards Australia New Zealand
FOPNL	Front-of-pack nutrition labels
GRI	Global Reporting Initiative
GRI database	Global Reporting Initiative Sustainability Disclosure Database
GLNC	Grains and Legumes Nutrition Council
HARPS	Harmonised Australian Retailer Produce Scheme
HSR	Health Star Rating
IGA	Independent Grocers of Australia
INFORMAS	International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support
NEMS-S	Nutrition Environment Measures Survey – Stores
PR	Public relations
PPP	Public-private-partnerships
RTE	Ready to eat
RTH	Ready to heat
SES	Socioeconomic status
SPIRIT	Standard Protocol Items: Recommendations for Interventions Trials
SOBF	Supermarket own brand foods
SOB	Supermarket own brands
UPF	Ultra-processed foods

UK	United Kingdom
UN	United Nations
US	United States
WA	Western Australia
Woolworths	Woolworths Supermarkets

Chapter 1 INTRODUCTION AND THESIS OVERVIEW

This chapter presents an explanatory overview of the research topic. It introduces supermarkets as food environments that can influence dietary patterns, and describes the potential for supermarket corporate social responsibility commitments to improve public health. The background to the research, aims, objectives, and outline of the thesis structure are provided.

1.1 Background

Globally, poor diet is a leading risk factor for noncommunicable diseases such as obesity, type 2 diabetes, cardiovascular disease, and some cancers [1]. In Australia, poor diet is the leading risk factor for premature deaths [2], and most Australians fail to meet the recommendations of government dietary guidelines [3]. The most recent Australian Health Survey (2011-2012) found that less than four percent of the population ate the minimum recommended amount of vegetables, only one-third ate the recommended amount of fruit, and 35 percent of the total energy consumed came from nutrient-poor discretionary foods [4]. Improving population diets to prevent and control noncommunicable diseases is a public health priority [5, 6].

Dietary intake is influenced in many ways including by physical or food environments (e.g. supermarkets), and macro-level environments (e.g. food production and distribution systems) [7]. The important role of food environments in promoting healthy diets has been highlighted by policy frameworks from the World Cancer Research Fund ('Nourishing'), and the International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support (INFORMAS) [8, 9]. Retail food environments such as supermarkets can support or undermine healthy eating [9], because consumers' eating patterns are influenced by what they encounter within and around the outlets [10]. Therefore, approaches to promoting healthy diets include addressing the food environment that consumers encounter when selecting and purchasing food [8], which have been described as 'consumer nutrition environments' [10, 11].

The proportion of foods sourced from supermarkets has increased globally, and the strategic decisions they make have many dietary implications [12]. For instance, supermarkets manage the marketing mix of product, price, placement and promotion of foods available for consumption, and provision of nutritional information [11]. Supportive supermarket consumer nutrition environments encourage healthful food choices, for example by selling good quality fruit and vegetables, or placing healthy foods in prominent positions in the store [13]. However, a number of supermarket practices of public health concern have been identified in Australia. Snack foods such as crisps and confectionery are prominently displayed on ends-of-aisles and checkouts [14, 15]; less than half of the packaged foods commonly available were classified as healthy [16]; and promotion of unhealthy foods designed to appeal to children is common in Australian supermarkets [17]. Interventions to improve food purchasing behaviour within supermarkets can be effective [18-20], so consumer nutrition environments provide a key setting for public health interventions to promote healthy diets.

Supermarkets have been described as having enormous power and influence, acting as "*gatekeepers of the food supply*" [12] (p658). In Australia, 63 percent of total food expenditure ($141.4 billion) was made at Australia's 4,200 supermarkets in 2012-2013 [21]. The Australian supermarket sector is highly concentrated; 2017-18 data from business research company IBISWorld showed the two largest chains Coles Supermarkets Australia Pty Ltd (Coles) and Woolworths Supermarkets (Woolworths) accounted for 68 percent of grocery sales [22]. This is one of the highest levels of retail concentration globally [23], and the two supermarkets have been described as having a dominant position in the Australian food system [24, 25]. Supermarkets have extended their power from retail into production by introducing supermarket own brand foods [25, 26]. Supermarket own brand foods (also known as private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers and sold privately in their own stores [27]. They are widely available in Australian supermarkets and around the world [28, 29]. However, little is known about their contribution to the healthfulness of supermarket consumer nutrition environments.

Comparisons of the nutrition content of supermarket own brand foods with branded foods (or national brands, manufacturer brands, premium brands, which are owned by food manufacturers [27]) have found no consistent differences across all foods. Australian studies comparing sodium [30], other nutrients [31], and serve size [31] found some

differences at the level of food category. Comparisons of the nutrition content of supermarket own brand foods conducted in the Netherlands [32], the UK [33], Spain [34], and Ireland [35], found similarly inconsistent results. Australian research shows some cost savings for consumers who purchase own brand foods [36, 37].

The Australian food regulatory system aims to protect public health and safety by providing sufficient information, preventing misleading information, and promoting healthy food choices [38], whilst recognising the need for an internationally competitive food industry [39]. Neoliberal governance, which minimises the policy role of government to promote global trade [40], encourages voluntary standards by food companies to address issues such as consumer food purchasing behaviour. This political context has allowed Australian supermarkets to assume a food governance role, whereby they make rules or decisions that impact the whole food system [41]. Supermarket food governance initiatives include imposing private standards on suppliers for food safety [42] and animal welfare [43], and making corporate social responsibility (CSR) commitments to address public concerns [41].

Supermarkets, and other food companies, state they make CSR commitments to protect consumer welfare [44]. However, CSR has been used as a mechanism to pass responsibility for selecting healthy foods from food companies to consumers [45], and to prevent effective regulation [46]. CSR has been described as a source of supermarket power, because it is used to set limits on the range of choices available to growers, manufacturers, and consumers [47]. The effectiveness of CSR has also been challenged because holding food companies to account for voluntary initiatives is difficult, as there are no established mechanisms [45]. To maintain credibility, it has been recommended that voluntary CSR commitments should be transparent, specify benchmarks or targets, and enable objective evaluation [44].

Some international supermarkets have made CSR commitments to improve the healthfulness of supermarket own brand foods [48, 49], or to encourage healthy eating [50, 51]. One CSR commitment made by the two Australian supermarket chains was to support the government-led voluntary Health Star Rating (HSR) front-of-pack nutrition labelling system, which aims to encourage healthier food choices [52]. The HSR allocates points for positive (dietary fibre, protein, and the proportion of fruit, vegetable, nut and legume content) or negative (saturated fat, sodium, total sugars)

nutrients and assigns a score from ½ star to 5 stars, with 5 stars indicating the healthiest choice [53]. Apart from support for the HSR and the other government-led population dietary health initiative, the Healthy Food Partnership [54], Australian supermarkets appear to have made few CSR commitments to public health. Previous Australian research has shown that supermarkets were less active than food manufacturing and food service companies in having CSR policies to assist customers to select nutritious foods [55].

In summary, few Australians eat according to the national dietary guidelines. Supermarket consumer nutrition environments can influence dietary intake and a number of practices of public health concern have been identified. Powerful supermarkets, which dominate the food system in Australia, have introduced supermarket own brand foods and assumed a food governance role. This includes setting CSR commitments which aim to address consumer welfare, but which also increase their power over the food system. Little is known about the contribution of Australian supermarket own brand foods to the healthfulness of consumer nutrition environments. The impact of Australian supermarket CSR commitments to public health is also not known. This thesis aims to address these research gaps.

1.2 Aim and objectives

The overarching aim of this research is to examine Australian supermarkets' CSR commitments that impact public health, and evidence of practical application, by analysing the contribution of supermarket own brand foods to Australian consumer nutrition environments. The four research objectives and corresponding research questions are provided below and in Figure 1.1.

1. To systematically review and synthesise the literature on supermarket power and consumer nutrition environments in Australia.

    RQ1. Which domains of the consumer nutrition environment (i.e., product, price, placement, promotion) have been examined in Australian peer-reviewed research?

RQ2. What is known about the multifaceted position Australian supermarkets occupy in the food system, including power and influence over other actors?

RQ3. What are the implications of supermarket power for public health?

2. To investigate the role of Australian supermarkets in assisting parents to navigate common within-store food marketing techniques to select healthy foods.

RQ4. What voluntary nutrition and health labelling, claims, and marketing techniques are present on high market-share ultra-processed foods in Australian supermarkets?

RQ5. Who do parents believe is responsible for giving them the information they need to make healthy food choices for their children?

RQ6. What role do parents believe food companies should take in helping them select healthy foods for their children?

3. To identify the extent to which own brand foods contribute to the healthfulness of Australian supermarket consumer nutrition environments.

RQ7. What is the extent and nature of supermarket own brand foods in Australia?

RQ8. What is the prevalence of nutrition labels on the front-of-pack of Australian supermarket own brand foods?

RQ9. How do Australian supermarket own brand foods rate for nutritional quality?

RQ10. Are Australian supermarkets using Health Star Ratings labels to promote nutritious or nutrient-poor own brand foods?

4. To investigate CSR commitments to public health nutrition by Australian supermarkets, and situate findings within the international supermarket sector.

RQ11. What public health related corporate social responsibility commitments have been made by supermarket chains globally?

RQ12. What is the nature and quality of Australian supermarket corporate social responsibility policies which can impact public health nutrition?

RQ13. Is there evidence of Australian supermarkets putting public health nutrition-related corporate social responsibility policies into practice within their stores?

1.3 Research setting and approach

A mixed-methods approach was used for this thesis because so little was known about the topic. Eight studies were conducted, and findings from each study informed subsequent studies. The study methodology included literature reviews and content analysis of publicly available supermarket CSR information. The findings were then combined with supermarket audits and focus groups that were conducted in Perth, Western Australia. First, the literature which describes the power and influence of Australian supermarkets was synthesised, and gaps in knowledge about Australian consumer nutrition environments were identified. Next, common within-store marketing techniques which can influence consumers' ability to select healthy foods were investigated using packaging audits. Focus groups were conducted to investigate parents' lived experience of selecting healthy foods in supermarkets. Supermarket audits were conducted to explore the contribution of supermarket own brand foods to the healthfulness of consumer nutrition environments. Lastly, Australian supermarkets' CSR commitments were assessed, and compared with the international supermarket sector, to identify opportunities for improvement that had been implemented elsewhere.

The focus of this thesis on supermarket own brand foods was based on the pivotal role they play as a source of supermarket power and impact on public health, which means they provide a more significant opportunity to improve public health nutrition than with other brands. Supermarket own brands contribute a quarter of household food purchases in Australia, and this proportion is even higher in some countries such as the UK and Switzerland (45%) [29]. Supermarkets themselves have been described as the largest food manufacturers in Australia [56]. Globally, market share of supermarket own brand foods is increasing, and predicted to continue to grow until they dominate

the food supply led by the largest supermarket chains [57]. Supermarkets have control of the whole supply chain for own brands and can guarantee access to consumers, which is something branded products cannot do. This makes them an important consideration for research regarding public health nutrition.

1.4 Definitions

This thesis refers to a number of concepts, which are defined below.

Branded foods	Branded foods (or national brands, manufacturer brands, premium brands) are owned by food manufacturers [27].
Consumer nutrition environments	Part of the conceptual model of community nutrition environments developed by Glanz *et al.,* 'consumer nutrition environments' refers to what consumers encounter within and around a food retail outlet, which includes supermarkets [10]. It includes the domains of product, price, placement and promotion.
Corporate social responsibility (CSR)	CSR is a strategy used by food companies to demonstrate good corporate citizenship [58]. This thesis applies *political* (i.e. large companies accept responsibility for their impact on society via corporate citizenship) and *ethical* (i.e. companies accept social responsibilities as an ethical obligation) CSR lenses to analysis of findings [59].
Corporate political activity (CPA)	The influence of powerful corporations over government policy that can impact public health [60].
Discretionary foods	Nutrient-poor-energy-dense foods are referred to as 'discretionary' foods in the Australian Guide to Healthy Eating. They should be limited because they are not essential for a healthy diet [3].
Food companies	All types of companies involved in the food system, including growers and farmers, food manufacturers, food wholesalers, food service operators, and food retailers.
Food environment	The retail outlets and other venues where people can buy or eat food, and all the foods within them that are available and accessible, as people go about their daily lives. They include supermarkets, as well as food stalls, coffee shops, school or workplace canteens, and restaurants [61].

Food governance	The rules or decisions made within the food system, and who makes them [62].
Food system	The people and activities required to make food available including farmers, food manufacturers, food service operators, food retailers, and government [61], as well as the end consumer.
INFORMAS	The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) is a global network of organisations and researchers that aims to monitor, benchmark and support actions that create healthy food environments and reduce obesity and noncommunicable diseases [9].
Neoliberalism	Supports reducing the policy role of governments in order to promote freer movement of goods, i.e. global trade [40].
Non-communicable diseases	Noncommunicable diseases include cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, and are a leading threat to human health [5, 63].
Public health	The conditions needed to improve health and prevent disease in a population [64].
Public health nutrition	Provision of safe, nutritious, affordable, secure, and environmentally sustainable food [65]. Public health nutrition includes the attributes of: accessibility, availability, cost and affordability, food preferences and choices, food safety and quality, nutritional quality, animal welfare, food and packaging waste, and sustainable sourcing.
Retail food environments	A term which encompasses community nutrition environments (i.e. the number, type, and distribution of neighbourhood food outlets) as well as consumer nutrition environments [66].
Supermarket own brands	Supermarket own brands are owned by retailers or wholesalers and sold privately in their own stores [27]. They are also known as private label, own label, in-house brand, store brand, retailer brand, or home brand.
Ultra-processed foods	The NOVA food classification system developed by Monteiro *et al.* categorises foods based on the extent and purpose of food processing. Ultra-processed foods form one of the four food categories, and are defined as industrially processed foods that include cosmetic or sensory additives such as colours, flavours, sweeteners, or processing aids, or undergo industrial processes which have no domestic equivalent such as extrusion [67].

1.5 Significance of this research

Australian supermarkets exert power over the food system, and influence population dietary intake by the strategic decisions they make. Within the neoliberal political context, consumers depend upon supermarket CSR commitments to support public health. Supermarkets have access to a wealth of information to inform business strategy, including CSR, which is not readily available to researchers and policy makers. A better understanding of the marketing techniques (i.e. product, price, placement, and promotion) used to influence consumer purchases of supermarket own brand foods is therefore needed. This research identifies supermarket own brand marketing practices of public health concern, along with opportunities to improve their contribution to healthful consumer nutrition environments in Australia. Supermarket CSR commitments to public health are summarised, and practical application in stores is evaluated.

Some of the findings of this research have already contributed to Australian food and nutrition policy. Firstly, the analysis of supermarket implementation of HSR on own brand foods presented in Chapter 5 has been used to provide expert input to the HSR Advisory Committee five year review of the system. My contribution included: (i) a joint written submission made with Dr Christina Pollard in August 2017; (ii) participation as an invited panel member at a forum discussing improvements needed to the HSR, organised by the Public Health Association of Australia in Canberra in November 2017; (iii) attendance at the Perth HSR stakeholders forum in March 2018; and (iv) meeting with the lead consultant for the review to discuss priority issues in March 2018.

Secondly, the analysis of nutrition and health related packaging information presented in Chapter 4 has been used to provide expert input to the Commonwealth Parliamentary inquiry into the obesity epidemic in Australia. The research informed the section on the role of the food industry in contributing to poor diets and childhood obesity in Australia, which I wrote for the Public Health Association of Australia's submission made in July 2018.

1.6 Personal context

The topic of this thesis relates closely to my prior studies and work experience, which has inevitably had some influence over the approach taken and interpretation of study findings. I am from the UK, where I completed an honours degree which involved studying food from many angles, including agriculture, manufacturing, the political economy of food, food regulation, food science and technology, and marketing. Following a master's degree in human nutrition, I worked in the UK food industry for ten years. During that time, I worked as the company nutritionist for two supermarket chains. Even as a new graduate, I could see the power and influence supermarkets had over what suppliers produced, and what consumers ate. Many years later in Australia, I worked closely with the two supermarket chains as a supplier, so experienced the power and influence first-hand.

I have also worked for a ground-breaking business which aspired to create a chain of healthy and sustainable fast-casual restaurants in the UK and the US. There were no case studies or frameworks to refer to, so every decision that could affect health and sustainability was a learning process. I discovered how difficult it is for a business with high ideals on such a complex area to communicate to customers why the food costs more. Whilst many food businesses make no attempt to support healthy and sustainable eating, some do. However, it is supermarkets, the gatekeepers of the food system, which should take the lead in supporting healthy and sustainable eating. Therefore, my hope is that the recommendations made to supermarkets in this thesis can assist in making changes for public health benefit.

1.7 Thesis structure

This hybrid thesis includes six manuscripts which have been published, and two that are under review, in international peer-reviewed journals. Manuscripts are clearly identified at the beginning of each relevant chapter. Numbering of the sections, tables and figures within the publications is consistent with the thesis format, so they differ to the original publications.

To address the four research objectives, 13 research questions were developed and answered by eight studies. The relationship between the overarching research aim, research objectives, research questions, and thesis structure are shown in Figure 1.1.

Chapter 2 reviews the literature and includes two systematic scoping reviews (sudies one and two).

Chapter 3 briefly outlines the methodology used as detailed methods are provided in each of published and submitted manuscripts. The detailed protocol for conducting audits of supermarket own brand foods (study five) is also included.

Chapter 4 sets the scene for the main body of research by describing common within-store marketing techniques and parents' ability to select healthy foods (studies three and four).

Chapter 5 describes compilation of a database of supermarket own brand food marketing practices which uses the data collected from audits of all own brand foods present in three large supermarkets. It uses some of the audit findings to respond to a policy-relevant question, demonstrating the utility of the audit data (study six).

Chapter 6 documents supermarket CSR commitments and uses some of the supermarket audit findings to analyse CSR practice. This chapter also provides context for the research findings by analysing CSR commitments made by the international supermarket sector (studies seven and eight).

Chapter 7 discusses the findings of all eight studies, and identifies the implications for public health research and practice, and for the supermarkets.

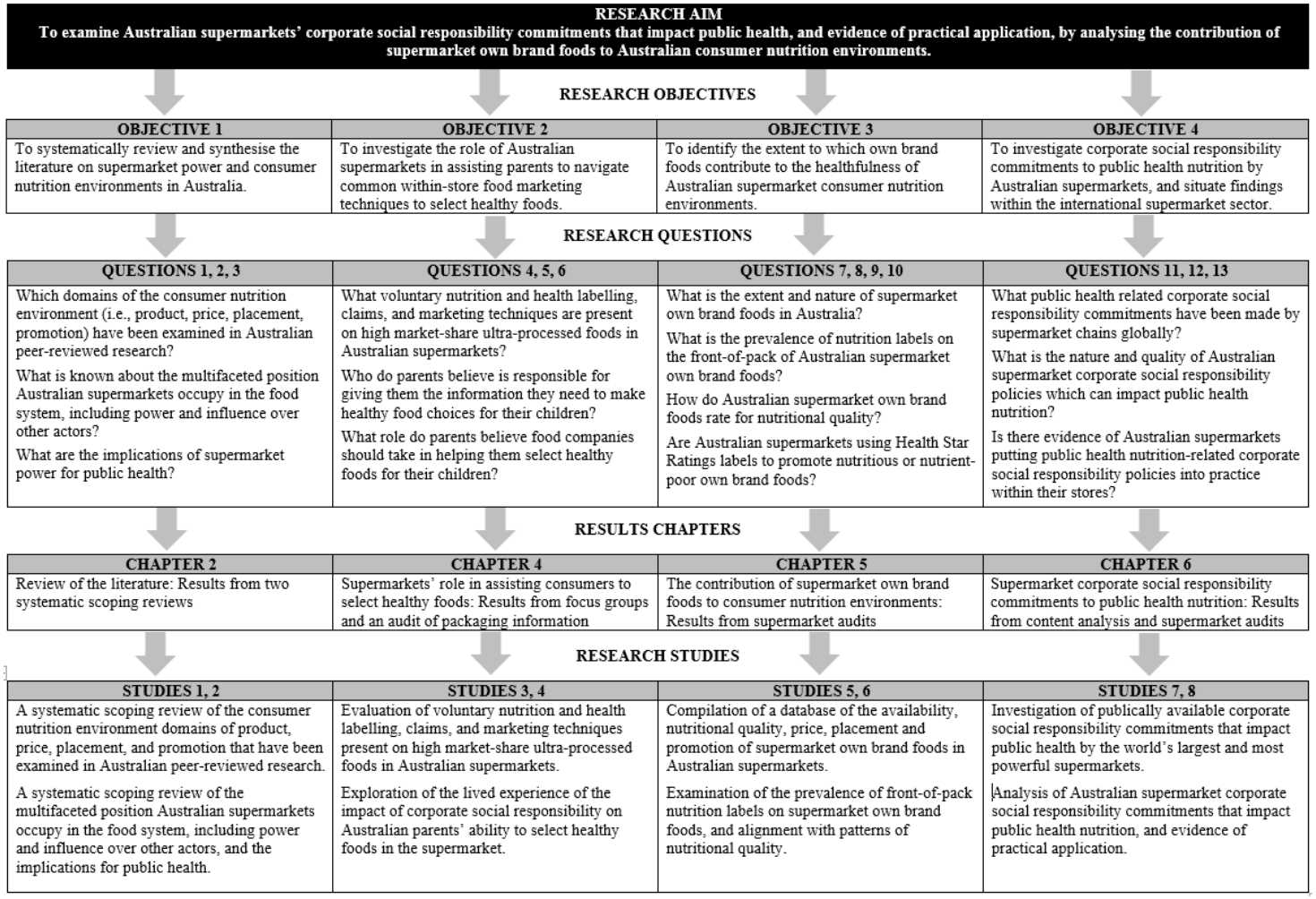
1.8 Referencing style and use of abbreviations

The American Medical Association (AMA) numbering style is used for references, rather than author and year (Havard), to assist with readability. This thesis required extensive reviews of the literature, leading to long lists of references within the results sections of the two scoping reviews. Use of numbers makes these sections easier to read and has been maintained throughout.

Abbreviations have been adopted for publications with limits on the amount of words in the abstract or main manuscript, however some publications without these limits

spell out these words in full. The content of each manuscript is included as accepted for publication, or submitted for review, therefore not all abbreviations are used consistently throughout the thesis.

Figure 1.1 The thesis structure



Chapter 2 REVIEW OF THE LITERATURE

This chapter includes two published manuscripts:

Pulker CE, Thornton LE, Trapp GSA. What is known about consumer nutrition environments in Australia? A scoping review of the literature. *Obes Sci Pract*. 2018; 4: 318-37. (*Obesity Science & Practice is a new international peer-reviewed journal from World Obesity.)*

Pulker CE, Trapp GSA, Scott JA, Pollard CM. What are the position and power of supermarkets in the Australian food system, and the implications for public health? A systematic scoping review. *Obes Rev*. 2018; 19: 198-218. (*Obesity Reviews, from World Obesity, has an impact factor of 8.483.)*

2.1 Overview of the chapter

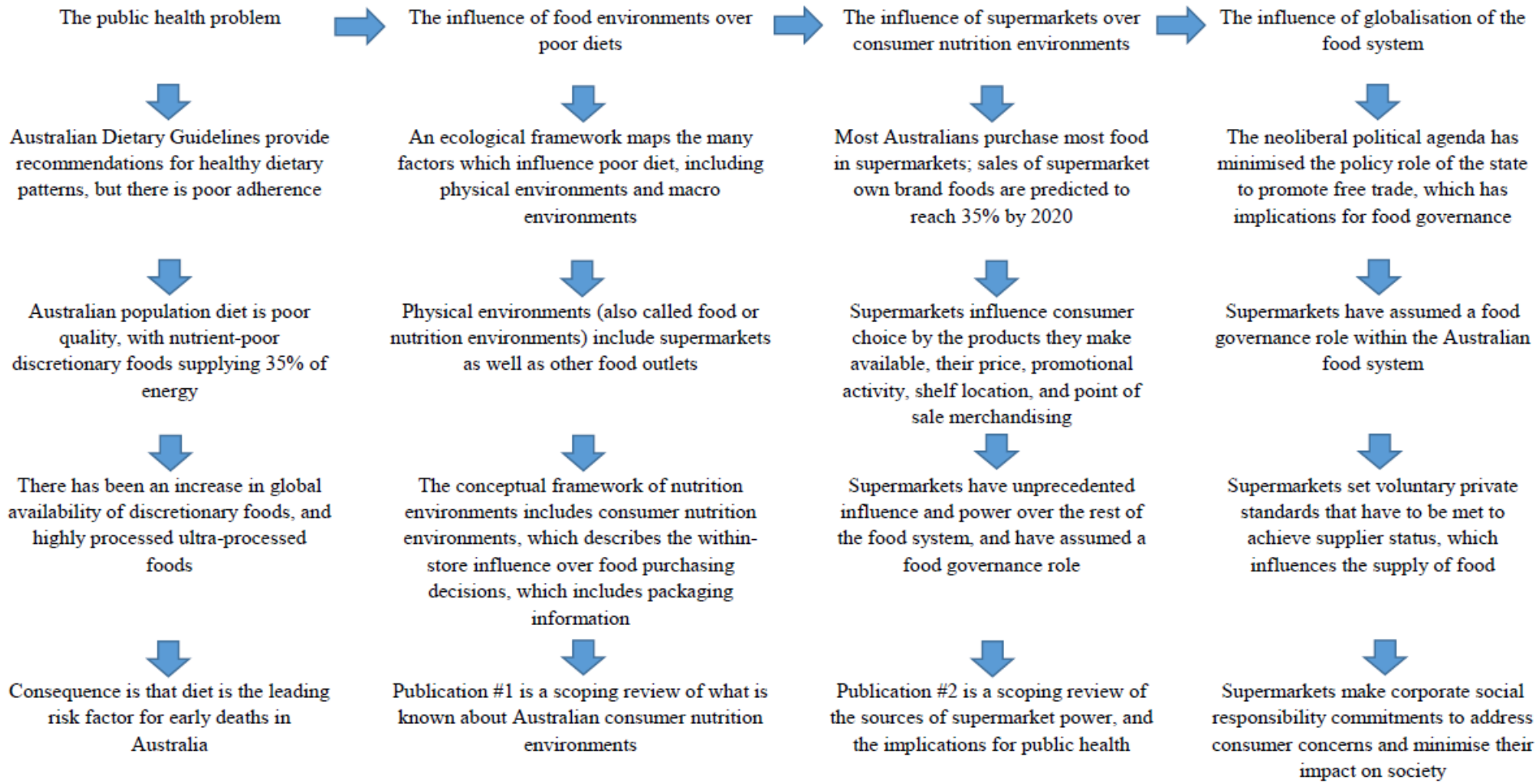
The objective of this chapter is to systematically review and synthesise the literature on supermarket power and consumer nutrition environments in Australia. Research questions were: (1) What is known about the multifaceted position Australian supermarkets occupy in the food system, including power and influence over other actors? (2) What are the implications of supermarket power for public health? (3) Which domains of the consumer nutrition environment (i.e. product, price, placement, promotion) have been examined in Australian peer-reviewed research?

This chapter summarises and critically evaluates other studies that are of relevance to the research topic. It is divided into three sections.

The literature review presented in the first section (2.2) addresses the public health problem of poor population dietary intake, the influence of consumer nutrition environments over poor diets, the power of supermarkets over consumer nutrition environments, and how globalisation of the food system has impacted the ability of Australians to consume the recommended nutritious diet (Figure 2.1).

The second and third sections are published systematic scoping reviews describing (i) what is known about consumer nutrition environments in Australia (section 2.3), and (ii) the position and power of supermarkets in the Australian food system and the implications for public health (section 2.4).

Figure 2.1 Logic flow which informed the literature review



2.2 Literature review

2.2.1 The public health problem

Globally, poor diet is a leading risk factor for noncommunicable diseases including obesity, type 2 diabetes, cardiovascular disease, and some cancers [1]. In Australia, poor diet is the top risk factor for premature deaths [2]. The Australian government provides evidence-based advice on healthy eating [3], but population dietary patterns are not consistent with the recommendations [3]. Results from the most recent Australian Health Survey (2011-2012) indicate that less than four percent of the population ate the recommended amount of vegetables, and one-third ate the recommended amount of fruit. Over half of the Australian packaged food supply are discretionary foods [68], and these nutrient-poor foods provided 35 percent of the total energy consumed [69]. Improving population diets to prevent and control noncommunicable diseases is a public health priority [5, 6].

A novel approach to developing policies to prevent and control diet-related noncommunicable diseases has been taken by Monteiro *et al* [70], who identified that the food supply in many countries is dominated by industrially processed food, driven by transnational food manufacturers, supermarkets, and fast food chains [71]. The NOVA system categorises foods by the extent and purpose of food processing, not by their nutrient profiles. However, the authors of the NOVA system argue that the level of food processing is the main determinant of a food's nutritional and environmental characteristics, and is not the issue itself [72]. The NOVA system now provides the basis for the dietary guidelines of Brazil, Uruguay, Ecuador and Peru, which recommend avoiding UPF [72]; thus it can be referred to as a measure of nutritional quality for public health benefit.

Industrially processed, or ultra-processed foods (UPF), typically include cosmetic or sensory additives such as colours, flavours, sweeteners, or processing aids, or undergo industrial processes with no domestic equivalent such as extrusion [67]. These foods have been found to have higher saturated fat, sugar and sodium content compared to less processed foods [67, 73], and are often identical throughout the world, undermining local food cultures and the environment [74]. UPF have been described as hyper-

palatable products that are attractively packaged and aggressively marketed, including making use of health statements and claims [67].

Evidence suggests consumption of UPF can increase the overall energy density of diets, displace unprocessed and minimally processed foods, and contribute to diet-related diseases [67]. In addition, convenient ready-to-eat and ready-to-heat UPF can displace home-cooked foods, disrupt social patterns of eating, harm cultural food habits, and cause economic and environmental issues through the domination of big corporations [75]. A synthesis of the peer-reviewed literature which has examined associations between UPF and the risk of diet-related chronic diseases found consistent evidence of increased risk when non-UPF are replaced by UPF [72]. Reformulation of UPF is the dominant response of the food system to diet-related disease and serves to reinforce or legitimise rather than challenge consumption of UPF [76]. One third of foods in the 2011-13 Australian food composition database were classified as UPF [77], and Australia ranked sixth out of 80 nations for total annual UPF retail sales using 2013 data [78]. Most new products launched in Australian in 2015 were UPF [79]. It is therefore important to consider the level of industrial processing when evaluating the contribution of products to population diets.

2.2.2 Food environment influence over dietary intake

An ecological framework of the many influences on dietary intake shows the influence of different environments, as well as individual factors [7]. It includes physical environments, also referred to as food or nutrition environments, which include supermarkets, restaurants, and other food outlets; and macro-level environments which include the globalised food system [7]. In recognition of the importance of physical food environments, INFORMAS aims to monitor and benchmark food environments, and efforts to improve them, across countries and settings in a systematic way to strengthen accountability for reducing dietary related noncommunicable diseases [9]. Work to assess and improve food environments is key to preventing noncommunicable diseases [80, 81].

The conceptual model of nutrition environments developed by Glanz *et al.* [10] identifies four types of environments: (i) community nutrition environments (i.e. the number, type, location, and accessibility of food outlets present in a community); (ii) organisational nutrition environments (e.g. workplace, school, sports clubs, or home);

(iii) information environments (i.e. media reporting and advertising); and (iv) consumer nutrition environments, which describe the within-store environment of food outlets, including supermarkets and restaurants [10]. Supermarkets manage the marketing mix of product, price, placement and promotion of foods available for consumption [11] which influences the healthfulness of the consumer nutrition environment.

Research investigating the placement and promotion of snack foods including crisps, chocolate and confectionery in Australian consumer nutrition environments has found they were prominently displayed at highly visible supermarket locations such as the ends-of-aisles and checkouts [14, 15]. Chocolate was most commonly displayed at prominent locations [82], particularly checkouts where the majority of displays were within children's reach [83]. Parents reported the most difficult areas of a supermarket when shopping with children were checkout displays of confectionery, and prominent displays of food packaging designed to appeal to children [84] which were widespread in Australian supermarkets [17, 85, 86].

Australian research investigating availability of healthy foods in consumer nutrition environments has found that less than half of the packaged foods commonly available in supermarkets can be classified as healthy [16]. The proportion was even lower for snack foods (9 to 22%) and beverages (14 to 27%) [87]. Over time, the nutritional quality of the yogurts and dairy snacks category has deteriorated and many reduced-fat products contained high levels of added sugars [88]. These findings indicate nutrient-poor foods are prevalent in the Australian food supply, which is concerning.

The role of price in Australian consumer nutrition environments has been assessed using a number of regional market basket surveys. The cost of food was found to be higher for those living in rural and remote regions in a number of studies [89-92]. However, the results of other studies differ, including: no association between the cost of healthy food and remoteness, socioeconomic status, or population size or density [93-95]; cost of healthy food was lower in socioeconomically disadvantaged areas [96]; and the proportion of household income spent on healthy food was significantly more for lower socioeconomic groups [97]. The purpose of these surveys was to assess food security, using cost and affordability data, not to evaluate the impact of price on the healthfulness of consumer nutrition environments. Therefore, the influence of food

prices on the healthfulness of Australian consumer nutrition environments is an important gap in knowledge.

Public health-led interventions in supermarket settings are generally effective in increasing purchases of healthy foods [18-20], so they provide a key setting for interventions to improve placement, promotion, price and availability of healthy foods. Interventions should be informed by robust observational studies, which identify supermarket practices of public health concern, measure the extent of the public health problem that can be addressed, and clearly prioritise the consumer nutrition environment attributes to change. A summary of what is known about Australian consumer nutrition environments would assit in identifying these priorities.

More healthful supermarket consumer nutrition environments are those that assist consumers to make healthful food choices, such as selling good quality fruit and vegetables, or placing healthy foods in prominent positions in the store [13]. A number of survey instruments have been developed to assess consumer nutrition environments, including in-store audit tools [98, 99]. Glanz *et al.* (2016) conducted a systematic review of available measures, and recommended that researchers select an existing quality assessed tool where possible [100]. The widely used Nutrition Environment Measures Survey in Stores (NEMS-S), developed in the United States of America (US), assesses availability of healthy options, price and quality and has undergone validity testing [101]. The Consumer Nutrition Environment Assessment Tool, developed and validated in the United Kingdom (UK), measures healthfulness of supermarkets including product variety, price, promotion, shelf placement, store placement, quality, healthier alternatives, nutrition information, and single fruit sale [13]. The US-developed 'GroPromo' tool assesses product placement and promotion and has been tested for reliability and validity [102]. The extensive Food Access and Costs Survey conducted triennially in Western Australia (WA) monitors the cost, variety, fresh food quality, availability and nutrition content of 430 foods in 158 grocery stores throughout the state [37]. However, to date there is no comprehensive supermarket assessment tool that includes the full marketing mix [11] or has been validated for use in Australian supermarkets.

A scoping review of what is known about consumer nutrition environments follows in section 2.3.

2.2.2.1 Food packaging information

Within consumer nutrition environments, promotion is present on food packaging which is a key marketing tool and the primary means of communicating information to consumers about product attributes [103]. A large proportion of supermarket purchases are made on impulse, so packaging information influences consumer food selection [86]. The wide availability of packaged foods designed to appeal to children is of particular concern [17].

Sixteen marketing techniques have been identified on packaging designed to appeal to children, including cartoons and celebrities, and most child-targeted products are unhealthy [86]. Excessive marketing of nutrient-poor discretionary foods, or fun foods [104], to children encourages overconsumption [105] and few Australian children consume diets consistent with Australian Dietary Guideline recommendations [69]. Australian parents are concerned about food marketing to children [106] and believe it influences their children's food preferences [107]. Policies that address the information provided on food packaging are needed to assist parents to select healthy foods [108].

Regulating food marketing on product packaging, including provision of labelling information, is a challenging food policy issue of public health significance [109]. The Australian and New Zealand food regulatory system is responsible for protecting public health and safety by providing sufficient information, preventing misleading information, and promoting healthy food choices [38], and plays a role in supporting an internationally competitive food industry [39]. In Australia, labels on packaging are permitted to display statements and claims about nutrition and health benefits, as outlined in the Australia New Zealand Food Standards Code [110]. In addition, the Australian government's voluntary front-of-pack Health Star Rating labelling system (HSR) was launched in 2014 to assist consumers to select healthier foods [111, 112].

The World Health Organization states that nutrient profiling, which classifies or ranks foods according to their nutrient content related to prevention of chronic diseases or promotion of health, can be a useful tool for regulatory purposes (e.g. restricting marketing of foods to children) [113]. Nutrient profiling which ranks the relative healthiness of foods based on a limited number of nutrients is not designed to form the basis of dietary advice, or be used to evaluate the healthiness of diets [114]. Instead, the scoring system used for the HSR and other nutrient profiling models is designed to

move beyond a binary classification of foods as healthy and unhealthy [114]. Implementing a non-binary system aims to encourage manufacturers to develop healthier processed foods, and drive reformulation to improve product nutrient profile scores [115]. Front-of-pack labelling has been a highly contested topic for many years, with the main debate centring on how nutrient profiling relates to dietary guidelines [116]. Some researchers and policy-makers support use of nutrient profiling to enable consumers to compare similar foods to identify the 'healthier' choice, and encourage product reformulation by manufacturers to gain more stars; whilst others have concerns about the inability of the HSR nutrient profiling algorithm to allocate foods scores consistent with the recommendations of the Australian Dietary Guidelines. The ability of the HSR to assist consumers to select packaged foods consistent with the Australian Dietary Guideline recommendations [3] is contested [117-119], so further investigation is warranted.

2.2.3 The influence of supermarkets over consumer nutrition environments

Supermarkets have been described as *"gatekeepers of the food supply"* [12](p658). The Australian food system has become more concentrated over the past forty years, with a reduction in the number of primary producers, food manufacturers and retailers [120-122]. This has been driven by the major supermarkets' supply arrangements and has made them increasingly powerful [25]. Supermarkets have moved beyond their traditional role in food distribution and retail, to exert influence on production and consumption [24]. This increase in power has led to supermarkets assuming a food governance role [41], including imposing private standards for food safety [42] and animal welfare [43], pushing the cost of food waste onto suppliers and charities [123], and creating CSR initiatives to address public concerns [41].

The proportion of household food budgets spent in supermarkets has increased since the economic downturn in 2008 [21]. In 2012-13 63% of total food expenditure ($141.4 billion) was made at Australia's 4,200 supermarkets [21]. The Australian supermarket sector is highly concentrated; Coles and Woolworths, the two largest chains, account for 70% of grocery sales [22], one of the highest levels of retail concentration globally [23]. There are also two smaller supermarket operators present in Australia: discount supermarket chain Aldi which has been credited with increasing the intensity of

supermarket competition in Australia [124], and IGA which is a network of independent supermarkets. Supermarkets influence consumer choice through the product assortment available and how they are arranged into categories, price, promotional activity, shelf location, and point of sale merchandising [125]. Given the level of influence exerted by supermarkets globally, and lack of examination of the public health implications of their power, more detailed information describing the Australian supermarket sector is needed.

2.2.3.1 Supermarket own brand foods

The power of supermarkets has extended beyond retail into manufacture, with the introduction of supermarket own brand foods. Supermarket own brand foods (also known as private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers, wholesalers or distributors and sold privately in their own stores [27]. They are widely available in Australia and around the world [28, 29]. Australian supermarket own brands are estimated to contribute 25% of grocery sales, and this is predicted to increase to 35% by 2020 [124]. In the UK, Spain and Switzerland, supermarket own brand products account for 40-45% of national grocery sales [126]. Sainsbury's in the UK reported over 50% of sales from own brands in 2014 [127]. Branded foods (or national brands, manufacturer brands, premium brands) are owned by food manufacturers [27].

Development of own brand foods is a marketing strategy used by supermarkets to meet a range of objectives which vary according to the product or food category (a group of similar products e.g. biscuits or pasta). Supermarket own brand foods can be used to increase profit margins, reduce manufacturers' negotiating power, improve product quality, improve consumer choice, or enhance the supermarket's reputation [128, 129]. Successful supermarket own brands tend to have better perceived product quality and active marketing support, in addition to high market share of grocery sales by the supermarket [27]. Australian supermarkets have declared ongoing commitments to continue to increase the presence of their own brand foods [130-132]. Market concentration of supermarket chains coupled with development of supermarket own brands influences the food supply and has potential to impact on population diets [133].

Globally, supermarket own brands have been most successful in high-purchase categories such as bread, milk and eggs; and the categories where consumers perceive

little difference when compared with branded products e.g. canned vegetables [126]. The success of supermarket own brands is often at the expense of small and medium sized brands [126]. For example, UK supermarket own brands typically account for 41% of a category's sales, followed by the market leading brand at 40%, and all other brands at 19% [126]. Supermarkets can use their knowledge of shopper behaviour to allocate prominence to their own brands at the expense of branded products [134]. This could result in reduced consumer choice, so it is important to monitor the development of supermarket own brand foods in Australia, and the implications for public health.

2.2.3.2 Contribution of supermarket own brand foods to consumer nutrition environments

Supermarket own brand foods' nutrition content and provision of information

Comparisons of the nutrition content of supermarket own brand foods with branded foods have found inconsistent results. Cleanthous *et al.* (2011) determined there was no consistent nutritional difference between Australian supermarket own brand foods and branded foods across 25 food categories, but found some differences at the level of food category [31]. Supermarket own brand breads and cereals contained significantly more sodium than the branded products [31]. A subsequent Australian study by Trevena *et al.* (2015) found the overall mean sodium content of Woolworths' and Coles' own brand foods was 17-28% lower compared to branded foods within the same categories [30]. Studies investigating the nutrition content of supermarket own brands in other countries have found similarly inconsistent results. A 2014 Dutch study found that there was no difference in the nutrition content of supermarket own brand foods compared to branded foods, apart from sodium where the branded foods contained significantly less [32]. Studies in the UK [33], Spain [34], and Ireland [35] have found no significant difference in nutrition content between supermarket own brand products and the branded equivalent. The growing number of supermarket own brand foods will inevitably displace branded products. Therefore, assessment of the healthfulness of supermarket own brand foods is needed to enable public health professionals to provide sound advice on their place in the diet.

Very little Australian research has investigated the use of nutritional information by supermarket own brand foods. Carter *et al.* (2013) found that the only companies consistently following the food industry's Daily Intake Guide front-of-pack labelling

guidelines [135] were supermarket own brands [136]. As Woolworths and Coles are key supporters of the Australian government-led Health Star Rating system [137], it is important to monitor application of these messages and devices on supermarket own brand foods to assess the likely impact on public health.

Price, placement and promotion of supermarket own brand foods

Australian research shows a significant cost saving for consumers who purchase supermarket own brand foods, making them an appealing option for the budget-conscious. A study conducted in 2009 by Chapman *et al.* (2013) revealed a mean cost saving of 44 percent when purchasing supermarket own brand foods across a range of categories [36]. The 2013 Food Access and Costs Survey in WA found that the price of the *Healthy Food Access Basket* was lower when supermarket own brand products replaced the branded equivalents [37]. The biggest cost savings were for breads and cereals (17 percent) and dairy (13 percent) due to the increased availability of supermarket own brand options in these categories [37]. Supermarket own brand products in the Netherlands [32] and France [138] were also significantly cheaper than the branded equivalent. A UK study by Cooper and Nelson (2003) found supermarket own brand foods provided consumers with better 'value for money', a measure which combined price and nutrition quality [33]. It is important to continue to monitor the price incentive offered to consumers to purchase supermarket own brand foods, because the cost of food influences food choice [139] and has public health implications.

To date, no studies have been identified that investigate the placement or promotion of supermarket own brand foods in consumer nutrition environments. Australian studies of the placement and promotion of snack foods have highlighted public health issues relating to promotion of foods to children [83, 84] and the prominence given to foods classified as discretionary [14, 15]. The contribution of supermarket own brand foods to these public health issues is therefore an important gap in knowledge and further research is recommended.

A scoping review of the sources of supermarket power and the implications for public health follows in section 2.4.

2.2.4 Globalisation of the food system

Supermarkets are supplied by a highly complex global food system (i.e. the people and activities required to make food available, including farmers, food manufacturers and government [61]). It significantly impacts population diets [8], and influences environmental sustainability [140] and social justice [141]. Globalisation of the food system has resulted in distancing consumers from their food, often with lack of transparency over social, environmental and ethical decisions [141].

Another implication of globalisation of the food system is the increasing concentration of food companies. The top ten food and beverage manufacturers control 90 percent of global food production, and the top ten supermarket chains control one-third of global food sales [142]. In Australia, there is a high level of foreign ownership of branded foods by transnational food manufacturers [143]. Vidler *et al.* (2018) reviewed the brands owned by the top 10 Australian food companies, revealing the breadth of market influence, and the illusion of choice in the supermarket [144]. This is important because transnational food manufacturers have been described as major drivers of noncommunicable diseases, undermining public health policies to maximise profits [145]. They influence population diets through their products, marketing activities and efforts to influence government public policies [146], and place responsibility for preventing obesity and other diet-related noncommunicable diseases onto individuals rather than food environments [147]. The impact of globalisation of the food system on the ability of Australian consumers to make healthful food choices in the supermarket should be investigated, to inform public policies to improve public health.

2.2.5 Neoliberalism

Principles of neoliberalism include minimal government intervention, market-centricity, risk management, and individual responsibility [148]. Voluntary measures and self-regulation strategies require the least government intervention [149]. Supporters of the approach say voluntary corporate actions are lower cost, more flexible, and less adversarial than traditional regulatory approaches [150]. Neoliberal governance encourages voluntary standards by food companies to address issues such as consumer food purchasing behaviour. Government responses to food marketing targeting children have also been driven by the dominant neoliberal political agenda in many

countries. This political context has allowed Australian supermarkets to assume a food governance role, whereby they make rules or decisions that impact the whole food system [41].

The neoliberal market-centric political agenda favoured by transnational corporations aims to minimise the regulatory role of government in order to promote free trade [40]. This means the ability of the global food system to support health and sustainability is influenced by supermarkets which wield enormous power and influence [12], as well as transnational food manufacturers [151].

In Australia, the government's focus on voluntary initiatives to assist consumers to make healthier food choices, includes the HSR interpretive labelling system which was launched in 2014 [112]. Public health responses often focus on providing information and education to assist individuals to select healthy foods [152] however, policy and regulations can alter population environments [153] and tend to be more effective, rapid, and equitable [152]. Neoliberal principles assume market forces will establish the best outcomes for society, but some economists have described two market failures evident within neoliberal political economies for nutrient-poor foods: the first is when the market does not adequately inform consumers about the consequences of their purchases, or they do not comprehend them; and the second is when the market imposes the costs of consumption onto society [154].

Responsible corporations have been described as those that pay a living wage and value employees, pay their share of taxes, and attempt to minimise their human and environmental impact [155]. For example, by applying marketing techniques to assist customers to select healthy foods, which have been identified for restaurants [156] and supermarkets [11]. However, other corporations sell products which damage human and planetary health, and fail to incorporate these harms into prices, or to inform or ensure consumers understand the consequences of their purchases [155]. Such corporations influence the global epidemic of noncommunicable diseases [145], and their actions have been described as the 'corporate determinants of health' [155]. When there is a failure of the market to ensure consumers purchase and consume recommended nutritious foods, corrective measures are needed by governments [155]. Supermarket food governance initiatives include imposing private standards on suppliers for food safety [42] and animal

welfare [43], and making CSR commitments to address public concerns [41], however the implications for public health are not known.

2.2.6 Supermarket corporate social responsibility

CSR is a strategy used by the global food industry, including supermarkets, which aims to enhance reputation by demonstrating good corporate citizenship. Food manufacturers and supermarket chains have the power to create consumer nutrition environments that are supportive of healthy food choices [55], and UK supermarkets have acknowledged this role [157]. To date, studies have found CSR has been used as a private governance mechanism to pass responsibility from the corporation to consumers [45] and to prevent regulation [46]. Industry-led schemes to restrict promotion of food to children in Australia [158], and in the US and Europe [159], have been found to be much less restrictive than government-led schemes. Holding companies to account for following voluntary government-recommended guidelines has proven difficult without mechanisms to acknowledge achievements or apply penalties [45].

CSR emerged in response to the deregulation that accompanied globalisation, acknowledging that some large companies including supermarkets have more power than some governments [59]. CSR theories state that large, powerful companies need to act as good corporate citizens, taking responsibility for impacting society in an ethical way [58]. For example, the Access to Nutrition Index (ATNI) [160] and Deloitte [161] have assessed the activity of transnational food companies and their contribution to encouraging healthful eating. The ATNI ranked the largest 22 global food manufacturers against seven main criteria related to impact on nutrition in 2013 [162], 2016 [160] and 2018 [163]. It found that some companies had made progress on increasing the importance of nutrition and health in corporate strategies and policies, and improving performance on provision of nutrition labelling [163]. The 2018 report identified the need for more food companies to adopt policies for responsible marketing to children, and to commit to not lobby against measures to protect public health [163]. Deloitte found that only 36% of the participating global retailer members of the Consumer Goods Forum reported they had publicly communicated their nutrition policies to consumers [161].

Some global supermarkets have made CSR commitments to improve the healthfulness of supermarket own brand foods [48, 49], or to encourage healthful eating [50]. There have been few peer-reviewed public health evaluations of Australian food industry CSR activity, and none focusing specifically on supermarkets to date. After reviewing publicly available policies and commitments of major food companies in Australia and other countries, Sacks *et al.* noted that supermarkets appeared to be less active in this area [55]. However, the authors also reported that using only publicly available information has limitations, for example data was not verified and some policies may have been missed [55].

INFORMAS provide recommendations for monitoring private-sector policies and practices which impact food environments, including CSR. They suggest collecting publicly available information as the first step; followed by analysing promotion, accessibility, and affordability and nutritional quality of available products; and finally analysing corporate political activity which aims to shape food and nutrition policy [164]. Step one of this framework was the basis of an assessment of European supermarket chain Lidl's policies relating to supermarket own brand product composition, marketing and promotion, product availability, pack sizes, price, and provision of nutritional information and education [165]. Lidl was selected for analysis because it was the only European supermarket chain with a comprehensive nutrition strategy, including quantified targets for all supermarket own brand foods [165]. The main areas of concern identified by the researchers were lack of transparency in the targets set, and lack of independent scrutiny [165].

INFORMAS developed a country-level supermarket assessment tool to rate CSR policies and commitments related to obesity prevention and nutrition, based on the ATNI methods [166]. Analysis of Australian supermarkets recommends they take much stronger action, including prioritising nutrition and health within corporate strategies, restricting marketing of less healthy foods to children, and limiting price promotions on less healthy products [56].

Greater understanding of the factors that are important to profit-making corporations are needed when recommending nutrition policies for food companies [167]. Sacks *et al.* (2016) recommended research that identifies opportunities for corporate activity that are consistent with public health goals is needed [167]. Within the neoliberal political

context where powerful Australian supermarkets have taken on a food governance role, it is important to identify their CSR commitments to support public health, and evaluate evidence of CSR practice.

2.3 Publication #1: What is known about consumer nutrition environments in Australia? A scoping review of the literature [1]

2.3.1 Summary

Objective: Food environments can influence food selection, and hold the potential to reduce obesity, non-communicable diseases, and their inequalities. 'Consumer nutrition environments' describe what consumers encounter within a food retail outlet, including products, price, promotion and placement. This study aimed to summarise the attributes that have been examined in existing peer-reviewed studies of Australian consumer nutrition environments, identify knowledge gaps, and provide recommendations for future research.

Methods: A systematic search of peer-reviewed literature was conducted. Sixty-six studies that assessed an aspect of within-store consumer nutrition environments were included.

Results: Most studies were published from 2011 onwards, and were conducted in capital cities, and in supermarkets. Studies assessed the domains of product (40/66), price (26/66), promotion (16/66), and placement (6/66). The most common research themes identified were assessment of the impact of area socioeconomic status (13/66), remoteness (9/66), and food outlet type (7/66) on healthy food prices; change in price of healthy foods (6/66); variety of healthy foods (5/66); and prevalence of unhealthy child-orientated products (5/66).

Conclusions: This scoping review identified a large number of knowledge gaps. Recommended priorities for researchers are as follows: (1) develop consistent observational methodology, (2) consider consumer nutrition environments in rural and remote communities, (3) develop an understanding of food service outlets, (4) build on existing evidence in all four domains of product, price, placement and promotion

[1] This is the accepted version of the following article: Pulker CE, Thornton LE, Trapp GSA. What is known about consumer nutrition environments in Australia? A scoping review of the literature. *Obes Sci Pract*. 2018; 4: 318-37, which has been published in final form at https://doi.org/10.1002/osp4.275|

and (5) determine effective policy and store-based interventions to increase healthy food selection.

2.3.2 Introduction

Globally, poor diet is one of the most important risk factors for early deaths [2] and few Australians adhere to the national dietary guidelines [3, 69]. The 2011-12 Australian Health Survey found only a third of the population met fruit consumption recommendations, less than 4% consumed the minimum recommended serves of vegetables, and 35% of total energy intake came from discretionary foods which are not essential for a healthy diet [4]. Increasing population adherence to dietary guidelines to prevent and control obesity, non-communicable diseases, and their inequalities is a public health priority [5, 6].

Making improvements in population diets requires multifaceted and multi-level interventions addressing macro-level and built environments, as well as social and individual factors [7]. Approaches to promoting healthy diets have been proposed in the 'Nourishing' and INFORMAS frameworks, which both highlight the important role of the food environment [8, 9]. The term 'food environment' is used to describe the surroundings, opportunities and conditions that influence people's food choices and nutritional status and includes the physical, economic, policy, and sociocultural environment [9]. Since food environments can create conditions that are supportive or unsupportive of healthy eating [9], actions to improve these environments have the potential to promote consumption of more healthful foods and beverages at the population level [7, 9, 19].

One aspect of food environments research investigates what consumers encounter within a food outlet, referred to by Glanz *et al.* as the 'consumer nutrition environment' [10]. Domains of the consumer nutrition environment which potentially influence food purchasing and eating patterns have been identified by Glanz *et al.* and include: *products* i.e., the availability of healthy and unhealthy foods, product assortment, design of products and packaging, and provision of supermarket own brands; *price* i.e., the price of healthy and unhealthy foods, price sensitivity and elasticity, and price promotions; *placement* i.e., the in-store location of products, or shelf-location of products; and *promotions* i.e., health messages, promotions targeting children, and other methods including signage, banners, samples, and taste-testing [11].

There is some evidence of an association between consumer nutrition environments and dietary outcomes [66]. For example, supermarket interventions to improve the healthfulness of retail food environments have shown promising results in influencing dietary behaviour [18, 19]. Strategies have included using pricing, monetary incentives, product availability and placement, and promotional messages to increase the availability, appeal and purchase of healthy foods [168, 169]. Furthermore, managing food position or order in food service settings (e.g. placing healthy options in easily accessible or more prominent positions) has been found to influence food choice [170]. Thus, consumer nutrition environments hold great promise as settings for health promotion interventions and policies targeting healthy eating.

A number of recent systematic reviews have been conducted to synthesise the consumer nutrition environments literature in this emerging field (see [18, 98, 100, 168-175]). However, none of these reviews have addressed all four domains which can influence food purchasing and eating patterns (i.e., product, price, placement and promotion). Furthermore, they have focused on a specific outcome such as diet or childhood overweight and obesity [98, 171, 172, 175], the measurement of consumer nutrition environments [100, 173, 174], or interventions [18, 168, 169]. Most of the studies included in these reviews have been conducted in the US. However, consumer nutrition environments are likely to be context-specific, and as such, empirical findings from the US may not always be internationally transferable [176]. For example, between-country differences have been observed in relation to the placement of snack foods in supermarkets [14], the size and nutrient profile of packaged supermarket foods [16, 177], and the promotion of healthy and discretionary foods in supermarket advertising [178]. In recognition of unique food environments issues faced in Canada, researchers have synthesised country-specific literature and identified gaps in knowledge to set priorities for future research and practice [179].

To date, there has not been a review of consumer nutrition environment research in Australia. In order to develop an evidence base that could be used to inform appropriate and effective public policy, a synthesis of consumer nutrition environments studies specific to the Australian context is needed. Scoping reviews have been defined as the process of mapping existing literature and identifying key concepts, theories, and sources of evidence. A scoping review can be used to summarise and disseminate research findings, and identify research gaps in the

literature [180]. The aims of this scoping review were to: (1) summarise existing peer-reviewed Australian studies that have examined consumer nutrition environments; (2) identify knowledge gaps; and (3) provide recommendations for future research. More specifically, the following research question is addressed: Which domains of the consumer nutrition environment (i.e., product, price, placement, promotion) have been examined in Australian peer-reviewed research?

2.3.3 Methods

2.3.3.1 Conceptual framework

The conceptual model of community nutrition environments provides a framework for this review [10]. The model identifies four types of nutrition environments: (i) community nutrition environments, which describe the distribution of neighbourhood food sources including the number, type, location, and accessibility of food outlets, such as stores and restaurants, present in a community; (ii) organisational nutrition environments, which describe the provision of foods to defined groups rather than the general population e.g. in the workplace, school, sporting clubs, or at home; (iii) information environments, which capture the influence of media reporting and advertising; and (iv) consumer nutrition environments, which describe the within-store environment of food outlets, including stores and restaurants, and is the focus of this review. Measures of consumer nutrition environments can include nutritional quality, product quality or freshness, price, promotions, placement, and provision of nutritional information. The literature was reviewed for the consumer nutrition environments domains of product, price, placement, and promotion [11].

2.3.3.2 Scoping review protocol

This scoping review followed the five step protocol described by Arksey and O'Malley and others [180-182]: (i) define the research question; (ii) identify relevant studies; (iii) select studies to include; (iv) chart, or synthesise, the data; and (v) summarise and report the results.

For the first step, the research question was defined as: Which domains of the consumer nutrition environment (i.e., product, price, placement, promotion) have been examined in Australian peer-reviewed research?

Search strategy

For the second step, a search strategy was developed to identify relevant studies. Key concepts of the research question were identified as 'consumer nutrition environments', 'food retail outlet', 'food and health', and limited to Australia. Search terms were developed for each concept (Table 2.1). The literature search was conducted in February 2018 using the Ovid Medline and CINAHL databases using the search terms listed in Table 2.1, limiting results to human studies in English. This was supplemented by a snowball search of the reference lists and citations of the selected articles, and hand searching. This search strategy identified 765 unique studies. A further 28 studies were identified by snowball and hand searching the selected documents.

Table 2.1 Search terms used

Concept	Search terms
Food and health	diet* or intake* or nutrition or consumption or Food or fast food* or processed food* or snack* or fruit* or vegetable* or health* or unhealthy or obesity or overweight or BMI or body mass index or weight or heart or diabete*
Food retail outlet	food store* or food outlet* or retail* or retail outlet* or food supply or supermarket* or grocery store* or convenience store* or restaurant* or cafe* or takeaway* or corner store* or market or farmers market* or garden* or community garden or vegetable garden or cafeteria or vending machine or canteen* or greengrocer or bakery or butcher or shop* or food hall
Consumer nutrition environments	availab* or price or promotion* or marketing or placement or nutrition information or marketing or consumer nutrition environment* or pric* or cost or information or market basket or shelf space or display* or prominence or polic* or advertis* or audit or NEMS
Australia	Australia or Perth or Victoria or New South Wales or Queensland or Northern Territory or Western Australia or South Australia or Adelaide or Melbourne or Sydney or Brisbane or Canberra or Tasmania or Hobart or Alice Springs or Australian Capital Territory

Study selection

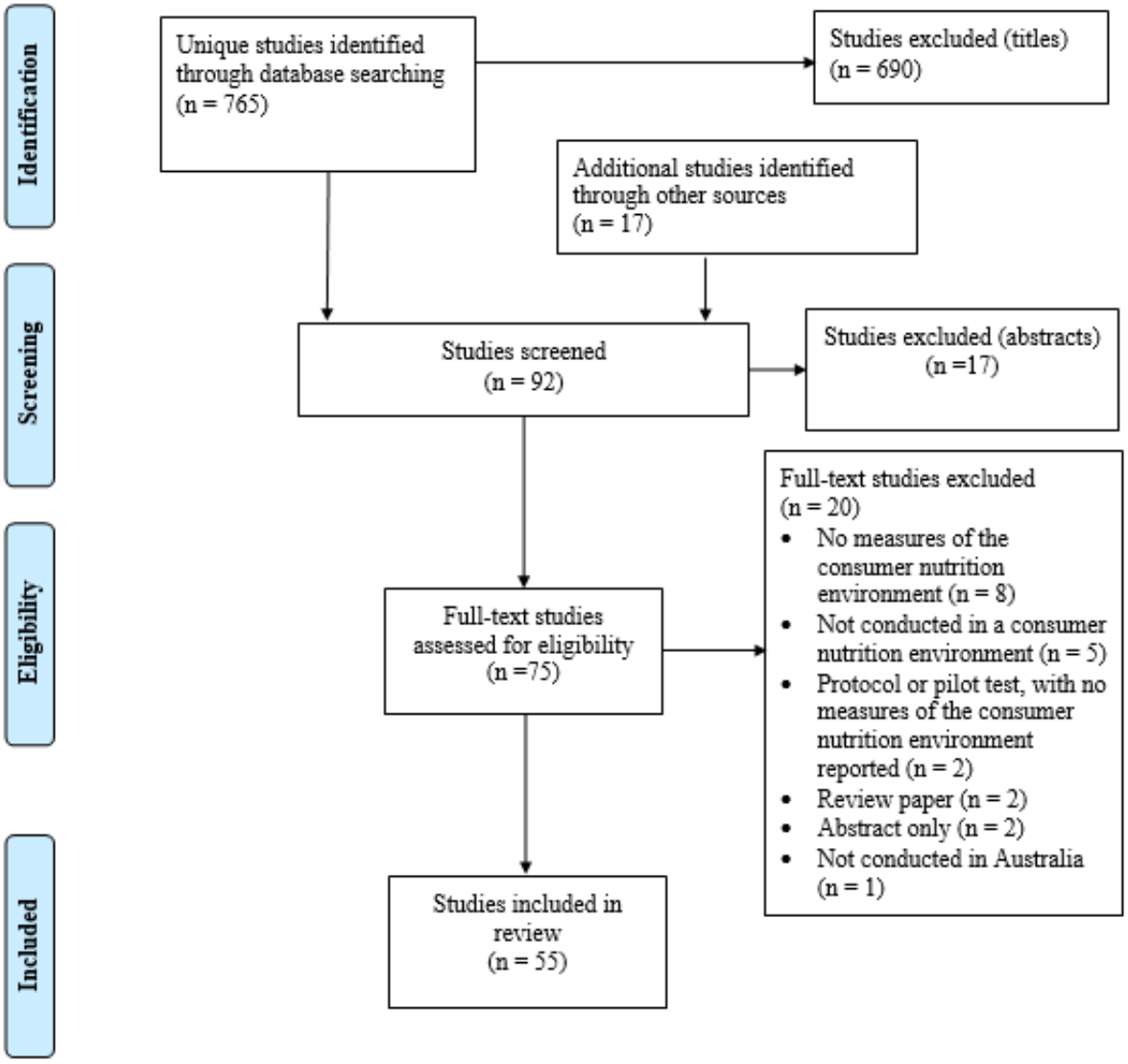
The third step of the Arksey and O'Malley protocol involved selecting which studies to include [180]. The titles and abstracts identified in the review (n = 793) were assessed against inclusion and exclusion criteria (Table 2.2) to select studies for further screening. After screening titles and abstracts, the full text of 86 studies were assessed for eligibility (Figure 2.2). Full text of all studies was reviewed by the first author. The second and third authors reviewed approximately ten per cent of studies against the inclusion and exclusion criteria, and any disagreements about study selection were discussed and resolved by all authors. This feedback process was adopted at the beginning of the review to ensure a consistent approach to assessment of all studies.

This scoping review included literature which described consumer nutrition environments accessible to the general population, i.e. food retail outlets such as supermarkets, convenience stores, restaurants, and fast food outlets (Table 2.2). Studies which assessed information from products or packaging collected from specified consumer nutrition environments were included (e.g. studies which described the price or nutritional quality of packaged foods in specific food outlets, where the data collection process was described in detail including specifying the locations and outlets under investigation). Studies which assessed an aspect of consumer nutrition environments using online food retail or food service websites were excluded. Studies which assessed the broader food supply were excluded (e.g. studies which described the price or nutritional quality of packaged foods in the food supply, using data collected from a wide range of outlets which were not specified). Studies which described aspects of the community nutrition environment (i.e. the number, type, location, and accessibility of food outlets), organisational nutrition environment (e.g. workplace, school, hospitals, sporting clubs, or home), or information environment (i.e. media reporting and advertising) without reference to consumer nutrition environments were also excluded.

Table 2.2 Inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Language	English	All other languages
Year	1970+	<1969
Country	Australia	International studies without relevance to Australia
Population	Humans	Animal
Food products	All food and non-alcoholic beverages	Alcohol, tobacco
Food environments	Consumer nutrition environments i.e. food retail outlets including supermarkets, convenience stores, restaurants, fast food outlets	Community nutrition environments, organisational nutrition environments, and information environments, without reference to consumer nutrition environments
Setting	Consumer nutrition environments, including products or packaging collected in specified consumer nutrition environments	Online food retail and food service websites; controlled environments including simulated food environments; simulated food packaging; or assessments of the general food supply
Study design	Observational (audits, surveys, product database analysis, point-of-sale data), randomised controlled trials, qualitative (interviews, focus groups), social marketing campaign evaluation	Protocols, reviews, survey instrument development that provided no results
Outcomes of interest	Consumer nutrition environment attributes i.e. available healthy and unhealthy foods; price; promotion; and placement	Food purchases, consumer purchase behaviour/ decisions, consumer understanding of nutritional information, drivers of the environment, impact of policy changes

Figure 2.2 PRISMA flow diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Data synthesis

For the fourth step, the data was charted to enable synthesis and identify themes. Information that described the following was collected: first author, year of publication, Australian State or Territory, location (i.e., rural, remote, metropolitan, capital city), study design, assessment tools, type of retail food outlet (Table 2.3), and findings. Data relating to any of the four domains of consumer nutrition environments were recorded for each study, and further classified into the following subdomains identified by Glanz and colleagues [11]: (a) Product availability and quality; (b) Product assortment; (c) Design of products and packaging; (d) Nutritional quality; (e) Provision of supermarket own brand products; (f) Pricing strategy; (g) Price sensitivity and elasticity; (h) Price promotions; (i) In-store location; (j) Shelf location; (k) Health messages; (l) Promotions targeting children; and (m) Other promotions.

Table 2.3 Types of food retail outlets that have been examined in Australian studies

Food retail outlet	Description
Supermarket	Stores are part of a supermarket chain, owned and operated by a large corporation
Independent supermarket/ grocery store	Supermarkets operated independently or under franchise
Discount supermarket/ grocery store	Supermarkets that sell cheaper, discount groceries with a focus on price rather than service or convenience, often part of a chain
Specialist food outlet	Cater to specific consumer needs, e.g. ethnic food store, health food, delicatessen, butcher, fishmonger, bakery, cake shop, greengrocer (fruit and vegetable stores)
Fast food	Also referred to as Quick Service Restaurants (QSR), typically part of a chain or franchise, includes takeaway, drive-through, and seated options
Takeaway	Ready-to-eat food sold for consumption off the premises
Community store	A shop located in a remote Aboriginal or Torres Strait Islander community, owned by the community who employ a store manager to run the store on behalf of the community [183]
Convenience store	Neighbourhood stores that sell groceries, ready-to-eat snacks, and other non-food items

2.3.4 Results

2.3.4.1 Characteristics of reviewed studies

In accordance with the final stage of the scoping review protocol adopted, a summary of the extent, nature, and distribution of the studies is given. Sixty-six studies were selected for inclusion in this scoping review, and a summary is provided in Table 2.4.

Few studies (4/66) were published before 2002, and most (41/66) were published since 2011. Over half of the studies were conducted in the more populous states of New South Wales (21/66) and Victoria (16/66). Nine studies were conducted in Queensland, seven in the Northern Territory, and five each in South Australia and Western Australia. More than half of the studies were conducted in capital cities (35/66). Some were conducted in metropolitan areas such as regional towns and centres (9/55), remote regions (8/66), or rural areas (4/66). Nine studies were conducted across a range of geographic regions.

Almost all studies were observational in design (i.e., audits, surveys, product database analysis, and point of sale data) (56/66), followed by qualitative studies (5/66), and randomised controlled trials (4/66). Supermarkets were the most studied type of food retail outlet (38/66) followed by community stores (6/66) and fast food outlets (4/66). Around one-fifth (15/66) studied multiple types of food retail outlets. The measurement tools used by most studies were standardised recording sheets (19/66) followed by market basket surveys (16/66), digital photographs (9/66), point of sale data (6/66), structured checklists (2/66), questionnaires (2/66), store food orders or invoices (2/66), interviews or focus groups (2/66), and hand held devices (1/66). Six studies utilised more than one measurement tool.

Table App 7.1summarises findings from the studies, for each domain and subdomain examined, grouped under common themes. The large number of themes, and the general lack of consistency or agreement in findings, informed the iterative scoping review process. Thus this study's objective was to summarise which domains of the consumer nutrition environment have been examined and the approaches used, rather than what was found.

The domain most studied was product (40/66), followed by price (26/66), promotion (16/66) and placement (6/66). For each of these domains, the subdomains and themes examined are summarised in Table 2.5.

Table 2.4 Summary of Australian consumer nutrition environment studies

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Ball [184]	2009	VIC	Capital city	Multiple	Structured checklist	Socioeconomic inequalities	b	f	-	-
Ball [185]	2015	VIC	Capital city	Supermarket	Transaction data	Food purchases, eating behaviour	-	g	-	-
Ball[186]	2016	VIC	Capital city	Supermarket	Transaction data	Food purchases, eating behaviour	-	-	-	k
Brimblecombe [187]	2009	NT	Remote	Multiple	Transaction data, food orders	Community dietary quality	d	f	-	-
Brimblecombe [188]	2013	NT	Remote	Community store	Transaction data	Community dietary quality	d	-	-	-
Brimblecombe[189]	2017	NT	Remote	Community store	Transaction data	Food purchases	-	g	-	k, m
Burns [89]	2004	VIC	Rural	Supermarket	Market basket survey	Food security	a	f	-	-
Cameron [15]	2013	VIC	Capital city	Supermarket	Standardised recording sheet	Snack food shelf space	-	-	j	-
Cameron[190]	2017	VIC	Multiple	Supermarket	Standardised recording sheet	Placement of snack foods and fresh produce	-	-	i, j	-
Campbell [84]	2014	NSW	Metropolitan	Supermarket	Interviews, focus groups	Impact of child-targeted in-store marketing	-	-	-	l
Carter [191]	2013	WA	Capital city	Supermarket	Standardised recording sheet	Compliance with voluntary guidelines	-	-	-	k

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Chapman [17]	2006	NSW	Capital city	Supermarket	Standardised recording sheet	Nature and extent of child-targeted packaging	d	-	-	l
Chapman [36]	2013	NSW	Capital city	Supermarket	Standardised recording sheet	Comparison of supermarket own brands with brands	e	f	-	-
Chapman [192]	2014	NSW	Multiple	Multiple	Standardised recording sheet	Food security	b	f	-	-
Cleanthous [31]	2011	NSW	Metropolitan	Supermarket	Hand held terminals	Comparison of supermarket own brands with brands	e	-	-	-
Crawford [193]	2017	NSW	Capital city	Multiple	Market basket survey	Food security	a, b	f	-	-
Dixon [83]	2006	VIC	Capital city	Supermarket	Standardised recording sheet, digital photographs	Displays of snack food	-	-	i	l, m
Ferguson [194]	2016	NT	Remote	Multiple	Transaction data	Food affordability	-	f	-	-
Ferguson [195]	2016	Multiple	Remote	Community store	Transaction data, semi-structured interviews	Food security	-	g	-	-
Giskes [196]	2007	QLD	Capital city	Supermarket	Standardised recording sheet	Impact of perceptions on food purchases	a	f	-	-
Harrison [90]	2007	QLD	Multiple	Not specified	Market basket survey	Food security	a	f	-	-

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Harrison [91]	2010	QLD	Multiple	Not specified	Market basket survey	Food security	a	f	-	-
Haskelberg [197]	2016	NSW	Capital city	Supermarket	Digital photographs	Serving sizes present on packaging	c, d	-	-	-
Hebden [85]	2011	NSW	Capital city	Supermarket	Standardised recording sheet	Nature and extent of child-targeted packaging	d	-	-	l
Hobin [198]	2014	Not specified	Not specified	Fast food	Standardised recording sheet	Nutritional quality of fast food children's menus	d	-	-	-
Hughes [199]	2013	NSW	Capital city	Supermarket	Digital photographs	Nature and extent of health claims on packaging	d	-	-	k
Inglis [200]	2008	VIC	Capital city	Multiple	Questionnaire	Eating behaviour	a	f	-	-
Innes-Hughes [201]	2012	NSW	Metropolitan	Multiple	Structured checklist	Food availability	a	-	-	-
Lawrence [202]	1999	Multiple	Multiple	Supermarket	Standardised recording sheet	Implementation of a health claim on packaging	a	f	-	k
Le [203]	2016	NSW	Capital city	Supermarket	Transaction data	Cost-effectiveness of an intervention	-	g	-	-
Lee [204]	1996	NT	Remote	Community store	Food orders	Implementation of community nutrition policy	a	-	-	k, m
Lee [205]	1996	QLD	Remote	Community store	Food orders	Community dietary quality	d	-	-	-
Lee [92]	2002	QLD	Multiple	Not specified	Market basket survey	Food security	a	f	-	-

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Lee [206]	2016	QLD	Capital city	Supermarket	Market basket survey	Effect of potential fiscal policy actions	-	f	-	-
Lewis [207]	2002	VIC	Multiple	Supermarket	Interviews, questionnaire	Effectiveness of a supermarket intervention	-	-	-	m
McManus [208]	2007	WA	Capital city	Multiple	Standardised recording sheet	Food security	a	f	-	-
Mehta [86]	2012	SA	Capital city	Supermarket	Standardised recording sheet	Nature and extent of child-targeted packaging	d	-	-	k, l
Meloncelli [209]	2016	QLD	Rural	Supermarket	Purchase of included products	Nutritional quality of child-targeted products	d	-	-	k, l
Millichamp [95]	2013	QLD	Capital city	Multiple	Market basket survey	Comparison of food outlet types	a, b	f	-	-
Ni Mhurchu [16]	2015	NSW	Metropolitan	Supermarket	Digital photographs	Nutrient profiling of packaged foods	d	-	-	k
Palermo [93]	2008	VIC	Rural	Supermarket	Market basket survey	Factors that influence food cost	-	f	-	-
Palermo [210]	2016	VIC	Multiple	Multiple	Market basket survey	Food security	-	f	-	-
Pollard [211]	2014	WA	Multiple	Multiple	Market basket survey	Geographic determinants of food security	a	f	-	-

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Savio [212]	2013	SA	Capital city	Supermarket	Standardised recording sheet	Description of child-targeted product reformulation	d	-	-	-
Scott [213]	1991	WA	Metropolitan	Supermarket	Questionnaires	Effectiveness of a supermarket intervention	-	-	-	m
Thornton [82]	2012	VIC	Capital city	Supermarket	Standardised recording sheet	Snack food display locations	-	-	i, j	-
Thornton [14]	2013	VIC	Capital city	Supermarket	Standardised recording sheet, checklist	Snack food display locations	-	-	i, j	-
Trevena [214]	2014	NSW	Capital city	Supermarket	Digital photographs	Nutrient reduction	d	-	-	-
Trevena [215]	2014	NSW	Capital city	Supermarket	Digital photographs	Nutrient reduction	d	-	-	-
Trevena [30]	2015	NSW	Capital city	Supermarket	Digital photographs	Comparison of supermarket own brands with brands, nutrient reduction	d, e	-	-	-
Tsang [96]	2007	SA	Capital city	Multiple	Market basket survey	Food security	a	f	-	-
Tyrell [216]	2003	NT	Remote	Community store	Market basket survey	Impact of a community diabetes prevention project	a	-	-	-

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Vinkeles Melchers [217]	2009	NSW	Capital city	Supermarket	Shopper dockets, standardised recording sheet	Food purchases	-	-	j	-
Walker [87]	2008	VIC	Capital city	Supermarket	Standardised recording sheet	Proportion of snacks that were healthy	b, c, d	-	-	-
Walker [88]	2010	VIC	Capital city	Supermarket	Standardised recording sheet	Comparison of nutrient profiles over time	c, d	-	-	k
Ward [97]	2012	SA	Rural	Supermarket	Market basket survey	Food security	-	f	-	-
Wellard [218]	2011	Multiple	Metropolitan	Fast food	Standardised recording sheet	Provision of nutritional information for fast food	c	-	-	-
Wellard [219]	2015	NSW	Capital city	Fast food	Standardised recording sheet	Provision of nutritional information for fast food	-	f	-	-
Wellard [220]	2015	Multiple	Metropolitan	Fast food	Standardised recording sheet	Provision of nutritional information for fast food	c	-	-	-
Wellard [221]	2015	NSW	Capital city	Supermarket	Digital photographs	Nutrient profiling of packaged foods	d	-	-	k

First author	Year	State or Territory	Location	Type of retail food outlet	Assessment tool	Study outcomes	Consumer nutrition environment domain			
							Product	Price	Placement	Promotion
Wellard [222]	2016	NSW	Capital city	Supermarket	Digital photographs	Nutrient profiling of packaged foods	d	-	-	-
Williams [223]	2004	NSW	Metropolitan	Multiple	Market basket survey	Food affordability	-	f	-	-
Williams [224]	2009	NSW	Metropolitan	Multiple	Market basket survey	Food affordability	-	f	-	-
Winkler [225]	2006	QLD	Capital city	Supermarket	Standardised recording sheet	Socioeconomic inequalities	a, b	f	-	-
Wong [94]	2011	SA	Capital city	Multiple	Market basket survey	Food security	a	f	-	-
Wu [226]	2015	NSW	Capital city	Supermarket	Digital photographs	Comparison of gluten free with standard foods	d	-	-	-

Footnote: Abbreviations: NSW, New South Wales; NT, Northern Territory; SA, South Australia; VIC, Victoria; WA, Western Australia. Consumer nutrition environment findings: (a) Product availability and quality; (b) Product assortment; (c) Design of products and packaging; (d) Nutritional quality; (e) Provision of supermarket own brand products; (f) Pricing strategy; (g) Price sensitivity and elasticity; (h) Price promotions; (i) In-store location; (j) Shelf location; (k) Health messages; (l) Promotions targeting children; (m) Other promotions

Table 2.5 Themes identified in Australian consumer nutrition environment studies

Domain and sub-domain	Themes relating to healthy foods with citations	Number of studies	Themes relating to less healthy/ unhealthy foods (citations)	Number of studies
Product (n=40)				
(a) Product availability and quality (n=17)	Impact of level of remoteness on availability of healthy foods [90-92, 202]	4	Availability of unhealthy foods [201, 208]	2
	Impact of area socioeconomic status on availability of healthy foods [94, 95, 196, 225]	4		
	Impact of food outlet type on availability of healthy foods [89, 95, 96, 201]	4		
	Impact of availability of healthy foods on food choice [196]	1		
	Impact of perceived availability of healthy foods [196, 200]	2		
	Interventions or policies to increase availability of healthy foods [205, 216]	2		
	Quality of fresh produce [95, 193, 211]	3		
(b) Product assortment (n=6)	Variety of healthy foods available [95, 184, 192, 193, 225]	5	Variety of unhealthy foods available [87]	1
(c) Design of products or packaging (n=5)	Changes in pack size of healthy foods [88]	1	Recommended serving sizes of unhealthy foods [87, 197]	2
			Provision of nutrition information for unhealthy foods in fast food outlets [218, 220]	2
(d) Nutritional quality (n=18)	Nutritional quality of healthy foods in remote communities [205]	1	Prevalence of foods with poor nutritional quality in remote communities [187, 188]	2
	Prevalence of healthy child-orientated products [17, 85]	2	Prevalence of unhealthy child-orientated products [17, 85, 86, 198, 212]	5
	Classification of packaged foods as healthy [16, 87, 226]	3	Classification of packaged foods as unhealthy [16, 197, 226]	3

Domain and sub-domain	Themes relating to healthy foods with citations	Number of studies	Themes relating to less healthy/ unhealthy foods (citations)	Number of studies
	Nutritional quality of products perceived as healthy [88, 199]	3	Nutrient reduction in processed foods [30, 214, 215]	3
	Nutritional quality of child-orientated products [209]	1		
(e) Provision of supermarket own brand products (n=3)	Nutritional quality of healthy supermarket own brand foods [30, 31]	2	Nutritional quality of supermarket own brand processed foods [30]	1
	Cost comparison of healthy supermarket own brand foods with the branded equivalent [36]	1	Cost comparison of unhealthy supermarket own brand foods with the branded equivalent [36]	1
Price (n=26)				
(f) Price strategy (n=22)	Impact of level of remoteness on price of healthy foods [91-93, 97, 192, 194, 202, 210, 211]	9	Comparison of the price of healthy and unhealthy foods in remote communities [187]	1
	Impact of area socioeconomic status on food prices [93-96, 184, 192, 193, 196, 202, 206, 210, 224, 225]	13	Comparison of the price of unhealthy foods/diet with healthy foods/diet [206, 219]	2
	Impact of food outlet type on food prices [89, 93, 96, 193, 194, 223, 224]	7	Change in price of unhealthy foods [210]	1
	Change in price of healthy foods [90, 91, 192, 210, 223, 224]	6		
	Impact of price on food choice [196]	1		
	Impact of perceived price on food choice [196]	1		
(g) Price sensitivity and elasticity (n=4)	Impact of price reductions on purchases of healthy foods [185, 189, 194, 203]	4		
(h) Price promotions (n=0)	-		-	
Placement (n=6)				
(i) In-store location (n=4)	Prevalence of healthy food displays at checkouts [83]	1	Prevalence of unhealthy food displays at checkouts, island bins, and ends-of-aisles [14, 82, 83, 190]	4

Domain and sub-domain	Themes relating to healthy foods with citations	Number of studies	Themes relating to less healthy/ unhealthy foods (citations)	Number of studies
(j) Shelf location (n=6)	Impact of area socioeconomic status on shelf location of healthy foods [15]	1	Shelf location of unhealthy foods [14, 82, 83, 217]	4
	Shelf space allocated to healthy foods [190]	1	Impact of area socioeconomic status on shelf location of unhealthy foods [15, 217]	2
			Shelf space allocated to unhealthy food [190]	1
Promotion (n=16)				
(k) Health messages (n=7)	Prevalence of health messages on packaging of healthy foods [199, 202]	2	Prevalence of health messages on packaging of unhealthy foods [86, 191, 199]	3
	Implementation of health messages in remote community stores [205]	1		
	Consistency of front-of-pack health messages with dietary guidelines [221, 222]	2		
(l) Promotions targeting children (n=4)	Changes parents shopping with children would like implemented in supermarkets [84]	1	Marketing techniques used to promote unhealthy foods to children [17, 85, 86]	3
			Prevalence of promotion of unhealthy foods to children [17]	1
(m) Other promotions (n=6)	Use of promotional signage to identify nutritious foods [189, 204]	2	Prevalence of unhealthy foods in store external displays [83]	1
	Impact of supermarket health promotion interventions [186, 207, 213]	3		
	Level of store support for supermarket health promotion interventions [207, 213]	2		

2.3.4.2 Product

Forty studies examined the domain of product (Table 2.5). Nutritional quality of food products were assessed most often (18/40); followed by product availability and quality (17/40); design of products and packaging (5/40); product assortment (6/40); and provision of supermarket own brand products (3/40).

Product availability and quality: Studies which examined this subdomain reported on the impact of geographic locality with regards to remoteness [90-92, 95, 202, 211], area-level socioeconomic status (SES) [94, 95, 196, 225], type of food outlet [89, 95, 96, 201] and interventions or policies [205, 216] on availability or quality of healthy food. Most used market basket surveys for data collection.[90-92, 94-96, 185, 193, 201, 210] To reduce subjectivity when evaluating quality of fruit and vegetables standardised quality assessment criteria were used by each study, although they were not all the same [95, 193, 211]. Two studies evaluated the impact of actual and perceived availability of healthy foods in supermarkets on purchasing choices [196, 200]. In relation to unhealthy foods, the availability of take-away foods and sugar-sweetened drinks, crisps, and pastries was examined in metropolitan and rural regions [201, 208].

Product assortment: Studies examined the variety of healthy or unhealthy foods available within retail food outlets [87, 95, 184, 192, 193, 225]. Assessments of healthy foods included availability of fruits and vegetables across different levels of area SES in Melbourne [184], Sydney [193] and Queensland [95]; level of remoteness in New South Wales [192]; and by type of food outlet in Brisbane [225]. One study assessed the variety of unhealthy snack foods and drinks available in a Melbourne supermarket [87].

Design of products and packaging: Changes in the pack size of yogurts and dairy desserts over time were assessed [88]. Recommended serving sizes on packaging of unhealthy foods were also assessed, including on single serve size packs of confectionery [87, 197]. Provision of nutrition information in fast food outlets has been monitored over time, along with accessibility of the information [218, 220].

Nutritional quality: Nutritional quality of foods available in consumer nutrition environments was the most studied product sub-domain. However, the way nutritional quality was defined differed by study. Examination of nutritional quality of foods in remote communities identified the prevalence of nutritionally poor foods such as

refined carbohydrates [188], and the contribution of these foods to community dietary energy availability [187]. The impact of store managers on nutrient intake of remote communities was evaluated [205].

Prevalence of healthy and unhealthy child-orientated products was examined by a number of studies.[17, 85, 86, 198, 212] This included identifying packaging with child-orientated promotional characters [17, 85, 86], and products with sportspersons, celebrities, or movie tie-ins.[85] The proportion of child-orientated products which had been reformulated between 2009 and 2011 was assessed for any improvement in nutritional quality [212]. Children's menu items from fast food outlets were evaluated by country and across companies [198].

Classification of packaged foods as healthy and unhealthy was reported [16, 87, 197, 209, 226]. Nutrient profiling models utilised included the Food Standards Australia New Zealand (FSANZ) Nutrient Profiling Scoring Criterion which is used to determine whether a food is suitable to make a health claim [16, 199, 209]; the New South Wales school canteen criteria, criteria developed for an Australian food company, and the United Kingdom traffic light criteria [87]; the Health Star Rating front-of-pack labelling device scores [226]; and the Australian dietary guidelines [197, 209]. Changes in energy, total fat, and protein content of yogurts and dairy desserts was assessed over time [88]. The nutritional quality of child-orientated foods promoted as healthy was evaluated [209].

Studies reporting nutrient reduction in processed foods all focused on sodium [30, 214, 215]. Progress made towards achieving Australian government-led sodium targets was assessed for bread, breakfast cereals, processed meats [214], pasta sauce [215], and a range of products spanning fifteen food categories [30].

Provision of supermarket own brands: Two studies evaluated the nutritional quality of supermarket own brand foods in comparison to branded foods [30, 31]. One study analysed products for differences between serve size, energy, total fat, saturated fat and sodium for supermarket own brand and brands [31]. A more recent study evaluated differences in mean sodium content of supermarket own brand products from different supermarket chains, and brands [30]. The cost of supermarket own brand foods was compared with the branded equivalent [36].

2.3.4.3 Price

Twenty-six studies examined the domain of price. Almost all studies (22/26) evaluated pricing strategy; few reported on the impact of price changes on consumer purchases (4/26); and none investigated price promotions.

Pricing strategy: Most studies reporting outcomes in this sub-domain investigated impact of level of remoteness [91-93, 97, 192, 194, 202, 210, 211], area SES [93-96, 184, 192, 193, 196, 202, 206, 210, 224, 225], or food outlet type [89, 93, 96, 193, 194, 223, 224] on the price of healthy foods. These studies compared the cost of healthy foods in rural and remote communities to metropolitan areas [91, 92, 97, 194, 211], and by increasing geographic isolation [92, 192, 210, 211]. The price of branded products was compared to supermarket own brands [36, 194]; packaged foods were compared with fresh fruit and vegetables [194], and dairy [211]; and the price of folate-fortified products was assessed [202]. Food prices were compared by area SES in Melbourne [184], Sydney [193] Brisbane [206, 225], Adelaide [94, 96], New South Wales [192], Queensland [95] Illawarra in New South Wales [224], and Victoria [93, 210]. Comparisons of food prices were conducted, including in supermarket chains and independent stores in rural Victoria [89, 93], and rural New South Wales [223, 224]; discount supermarkets, supermarket chains, and independent stores in Sydney [193]; and online and in-store in Darwin [194].

Comparison of the price of healthy and unhealthy foods or dietary patterns was conducted by calculating the cost per kilojoule of foods available in a remote community [187] and for fast food menu items [219], and by using a market basket survey [206]. A number of studies evaluated changes in the price of healthy foods over time using market basket surveys [90, 91, 192, 210, 223, 224]. One study evaluated the association of actual and perceived food prices with food choices [196].

Price sensitivity and elasticity: Four studies reported the impact of price reductions on purchases of healthy foods [185, 189, 195, 203]. The randomised controlled trial reported by two studies assigned shoppers to a skill-building group, price-reduction group, a combined skill-building and price-reduction group, or a control group. Behaviour-change outcomes [185, 203] and intervention cost effectiveness [203] were reported. A stepped-wedge randomised controlled trial conducted in remote community stores in the Northern Territory examined the effectiveness of a price discount on purchases

with and without consumer education [189]. A natural experiment utilised mixed methods to evaluate the impact of four price discount strategies in remote community stores [195].

2.3.4.4 Placement

Only six studies reported aspects of the placement domain, including evaluations of shelf location, and size or prominence of product displays (6/6); and the physical location of products in stores (4/6).

In-store location: Studies assessed the prevalence of snack food displays at supermarket checkouts, island bins, and end-of-aisle displays [14, 82, 83, 190]. Impact of area SES on in-store location of snack foods was assessed [82]. Displays of fruit and vegetables at checkouts were also reported [83].

Shelf location: Impact of area SES [15] and geographic location [190] on the amount of shelf space allocated to fruits and vegetables was investigated. Prominence of snack food displays was investigated at supermarket checkouts [14], including evaluating whether displays were within children's reach [83]. The most prominent snack food on display at supermarkets was identified [82], along with physical measurement of snack food aisle lengths [14], and island bin snack displays [82]. The association between the proportion of shelf space allocated to unhealthy foods and the amount purchased was reported by one study [217].

The impact of area SES on position and prominence of foods was assessed by two studies [15, 217]. Two studies reported the amount of supermarket shelf space for snack foods as well as fruits and vegetables by area SES [15] and by geographic location [190]. The association between purchases and shelf space allocated to unhealthy foods was evaluated by area SES [217].

2.3.4.5 Promotion

Sixteen studies investigated aspects of the promotion domain. Health messages on packaging or signage received the most attention (7/16); followed by packaging promotions targeting children (4/16); and other types of promotions including signage, shelf labelling, and product samples (6/16).

Health messages: Prevalence of health messages on healthy and unhealthy foods was reported by most of the studies within this sub-domain [86, 191, 199, 202]. Evaluation of the

prevalence of health claims included use of the folate-neural tube defect health claim [202], and whether or not foods met the draft FSANZ Nutrient Profiling Scoring Criterion which are now used to determine whether a food is suitable to make a health claim [199]. The prevalence of snack foods featuring the food industry's voluntary Daily Intake Guide front of pack label, along with level of compliance with guidelines for its use was evaluated [191]. Health messages on the front of packaging were assessed for consistency with the Australian Dietary Guidelines [221, 222]. Finally, prevalence of statements and claims about health and nutrition on foods identified as child-orientated was reported [86].

One study evaluated implementation of health promotion messages in remote community stores and associated dietary improvements for the community [205].

Promotions targeting children: Studies identified and described the marketing techniques used to promote packaged foods to children in supermarkets [17, 85, 86]. One study identified prevalence of packaging which used characters from TV, films, and cartoons to appeal to children [17], which was reinforced by a more recent study which described sixteen techniques employed to appeal to children [86]. Another study investigated use of these characters on healthy or unhealthy products, and whether the manufacturers were signatories to the food industry's voluntary children's marketing code [85]. Changes parents shopping with children would like implemented in supermarkets were also described [84].

Other promotions: The studies in this sub-domain described a range of outcomes related to other promotions, including use of promotional signage to identify nutritious foods in community stores [204], and communicate a price discount on fruit and vegetables [189]; level of store support and impact of supermarket health promotion interventions [207, 213]; and promotion of snack foods outside of stores [83].

2.3.5 Discussion

This scoping review aimed to identify and summarise the domains of the consumer nutrition environment (i.e., product, price, placement, promotion) which have been examined in Australian peer-reviewed research. This is an emerging field of research in Australia, as evidenced by the fact that most of the 66 studies identified were published from 2011 onwards. The domain most studied was product, followed by

price, then promotion. Few studies examined placement and no studies addressed all four domains of product, price, placement and promotion. Indeed, ten of the thirteen sub-domains were examined by seven or less studies, typically reporting mixed findings. Gaps in knowledge were evident across all four domains of consumer nutrition environments. These gaps, along with recommendations to address them are presented below.

The first recommendation is to develop consistent observational methodology. Development of standardised observation tools that are appropriate for use in Australian consumer nutrition environments is a priority. Within each subdomain a lack of consistency amongst the observation tools utilised was found, which makes comparisons of study findings difficult. Whilst the selection of survey instrument needs to be appropriate to the purpose of the assessment [99] and the specific context to be investigated (e.g. remote or regional communities compared to urban areas), it is recommended that researchers select an existing quality assessed tool where possible [100]. Furthermore, some studies lacked details of who collected the data in the retail outlets, or how the information was recorded or validated [17, 30, 212, 214, 217].

To reduce subjectivity when evaluating nutritional quality, or defining food as healthy or unhealthy, standardised criteria should be applied. In Australia, criteria could include: food group classifications consistent with the Australian Guide to Healthy Eating [227], the principles for identifying 'discretionary foods' [228], or FSANZ's nutrient profiling model [229] which classifies products according to whether they are suitable to carry health claims on packaging.

The work of INFORMAS aimed to standardise food environments monitoring in diverse countries and settings, to assist public and private sector actions to create healthy food environments and reduce obesity, non-communicable diseases, and their inequalities [9]. Table App 7.2 identifies the INFORMAS modules relevant to each consumer nutrition environment sub-domain, to assist with development of consistent methodology. Future research should also clearly describe the setting under examination when reporting findings, including identifying the food outlet type and location, to build understanding of specific consumer nutrition environments. A number of studies that described the nutritional quality of the Australian food supply

were excluded from this scoping review due to lack of information on the specific consumer nutrition environments under investigation.

The second recommendation is to consider consumer nutrition environments in rural and remote communities. Few studies were conducted in remote community stores [187-189, 194, 195, 204, 205, 211, 216] so little is currently known about these environments. These studies have examined only six of the thirteen subdomains: product availability and quality [205, 211, 216], nutritional quality [187, 188, 205], price strategy [187, 194, 211], price sensitivity and elasticity [189, 195], health messages [205], and other promotions [189, 204], and their findings cover only nine of the 53 identified themes. Australians living in rural and remote regions are more likely to be overweight or obese resulting in a higher incidence of non-communicable diseases [230], thus food retail outlets present in these communities hold great potential as settings for health promotion interventions [211].

The third recommendation is to understand consumer nutrition environments in different food retail outlet types and under-researched sub-domains. This scoping review found that supermarkets were the most studied type of food retail outlet, followed by community stores, with few studies of fast food outlets. Whilst more research is needed within each of these settings, there are many food outlets types which are yet to be examined in Australia, such as convenience stores, service stations, greengrocers, cafes, restaurants, takeaway food outlets other than fast food chains, and fresh food markets. Food environments research to date has included only a limited range of food outlets [231]. International research suggests that consumer nutrition environment findings can vary by food outlet type [66], thus more research within and across different food outlets is needed.

Under-researched consumer nutrition environments sub-domains include product assortment. Little is known about the amount of product choice available within consumer food environments. This is important because product assortment has been shown to influence consumers' food choice [11].

Few studies examined the packaging design of products. Packaging has been described as integral to the product [109] and packaging design includes size and format, as well as provision of nutrition information and recommended serving sizes [11]. Since most food purchase decisions are made at the point of sale after only a few seconds [232], it is

important to investigate which packaging design techniques make foods appealing within a consumer nutrition environment.

Provision of supermarket own brand products is another under researched area identified in this study. Supermarket own brand products are are owned by retailers or wholesalers and sold privately in their own stores [27]. Australian supermarket own brands are estimated to contribute 35% of grocery sales by 2020 [124]. However, little is known about them other than sodium content [30].

There is a gap in information about the impact of price changes on the healthfulness of consumer purchases. Priorities for research needed to fill this gap have been identified by Epstein and colleagues, including examining which foods are most effective to target, and whether health benefits are experienced by the sub-populations most in need [233].

There are no Australian studies that have reported prevalence or type of price promotions present in consumer nutrition environments, such as price reductions, multi-buy offers or coupons.

Only four studies examined the presence of health messages on food packaging [86, 199, 221, 222], and one study reported on the compliance of voluntary labelling initiatives [191]. Two of the studies considered whether health messages present on packaging were consistent with the recommendations of the Australian Dietary Guidelines [221, 222]. More evidence of current practice is needed, along with analysis of other in-store methods for communicating health, such as leaflets and signage.

Few studies have examined use of signage, banners, shelf labelling, samples and taste testing in food retail outlets [83, 189, 204, 207, 213]. Investigation of the prevalence and impact of these promotions is needed.

The fourth recommendation is to build on the existing evidence in all four domains of product, price, placement and promotion. More research is needed to replicate and build upon the existing evidence-base across all four domains. In particular, future research should focus on extending the evidence-base within the subdomains of product availability and quality, pricing strategy, in store location, and promotions targeting children.

Most of the studies reporting availability of healthy foods were market basket surveys [89-92, 94-96, 193, 210, 211, 216]. Whilst market basket surveys are ideal to assess community food security using cost and availability data, they may not be appropriate for evaluation of the 'overall healthfulness' of consumer nutrition environments due to the focus typically placed on provision of healthy foods. More studies are needed that describe the availability of healthy and unhealthy foods, using standardised definitions of what is healthy or unhealthy such as food group classifications consistent with the Australian Guide to Healthy Eating [227].

There was some evidence that food outlet type, but not area SES, can influence food price, so a clearer understanding of this across different food outlet types is needed. Few studies have investigated differences in the price of healthy and unhealthy foods [187, 196, 219]. As price is a key strategy used by retailers to gain competitive advantage [12], building a greater understanding of how food purchase decisions are influenced through pricing strategy is important.

Placement of unhealthy snack foods and beverages has been investigated [14, 15, 82, 83, 217], but there is a gap in information about the in-store location of displays of healthy products. Public health researchers have identified replacing highly visible displays of unhealthy snacks with healthy foods as an opportunity for reducing snack food purchases [11], so more information about in-store location of displays of healthy and unhealthy foods is needed.

Whilst promotion of unhealthy foods to children was examined by a number of studies [17, 84-86], more evidence is needed to build a greater understanding of the in-store marketing techniques used, the product categories of interest, and the interventions needed to prevent these practices from adversely affecting children's diets.

The final recommendation is to determine effective policy and store-based interventions for healthy eating. This scoping review identified eight store-based intervention studies which aimed to improve purchasing or dietary behaviour, conducted in supermarkets and remote Northern Territory community stores [185, 186, 189, 203, 204, 207, 213, 216]. A number of successful strategies were identified, including a 20% price reduction for fruit and vegetables in metropolitan supermarkets which led to increased purchases over the intervention period, although this was not maintained afterwards [185]; a 20% price reduction for fruit and vegetables in remote community

stores led to increased purchases which was further enhanced by consumer education [189]; a nutrition education programme encouraging purchases of low-fat dairy, fruit, vegetables, bread and cereals achieved changes in self-reported food purchasing behaviour [213]; a behaviour change intervention led to increased vegetable consumption [186]; introduction of a nutrition policy across five remote community stores led to dietary improvements in the communities that most complied [204]; and a diabetes health promotion intervention led to increased range and availability of healthy foods in a remote community store, and increased community-level purchases of healthier food [216].

Whilst identification of these strategies is encouraging, studies have only reported findings from three consumer nutrition environment sub-domains of product availability and quality [216], price sensitivity and elasticity [185, 203], and other promotions [204, 207, 213], spanning five of the 53 themes identified. Interventions need to be informed by observational studies which clearly identify the attributes of consumer nutrition environments which are a priority for change, and measure the extent of the problem. Building the evidence-base across all four domains of product, price, placement, and promotion will help to determine which policies and interventions might be effective at developing consumer nutrition environments supportive of healthy eating. Evaluation of in-store interventions will be essential, including identifying unintended consequences, to support positive changes in food purchasing and dietary behaviour.

This is the first study to summarise the existing peer reviewed literature relating to consumer nutrition environments in Australia, and the first review to include all four domains of product, placement, price and promotion. This study applied the conceptual model developed by Glanz and colleagues [10] and followed the established five-step protocol for scoping reviews [180]. In addition, the main findings for each of the themes identified in Australian consumer nutrition environment studies have been summarised In Table App 7.1. Limitations include the possibility that the search strategy did not capture all relevant documents, and the current study has therefore overlooked some existing knowledge on Australian consumer nutrition environments. This risk was minimised by scanning the reference lists and citations of included studies, the authors' knowledge of the research field, and the search terms that were based on prior studies. Consistent with the scoping review protocol, quality of included studies was not evaluated [180].

This scoping review identified which domains of the consumer nutrition environment have been examined in Australian peer-reviewed research to date. Across 13 consumer nutrition environment sub-domains 53 themes were identified. The most common were assessment of the impact of area socioeconomic status (13/66), remoteness (9/66), and food outlet type (7/66) on healthy food prices; change in price of healthy foods over time (6/66); variety of healthy foods available (5/66); and prevalence of unhealthy child-orientated products (5/66). A large number of gaps in knowledge were identified. The key priorities for future Australian research are to: (1) develop consistent observational methodology; (2) consider consumer nutrition environments in rural and remote communities; (3) understand consumer nutrition environments in different food retail outlet types such as food service, and under-researched sub-domains such as price promotions; (4) build on the existing evidence in all four domains of product, price, placement and promotion; and (5) determine effective policy and store-based interventions for healthy eating. Research consistent with these recommendations should assist with creating Australian consumer nutrition environments supportive of healthy choices, and increase population adherence to dietary guidelines to prevent and control obesity, non-communicable diseases, and their inequalities. In recognition of the country specific nature of food environments, other countries may also benefit from conducting similar scoping reviews.

2.3.6 Footnote

Findings from the scoping review that are specific to supermarket consumer nutrition environments have been summarised in Table App 7.3.

2.4 Publication #2: What are the position and power of supermarkets in the Australian food system, and the implications for public health? A systematic scoping review [1]

2.4.1 Summary

Supermarkets have been described as having unprecedented and disproportionate power in the food system. This scoping review synthesised the literature that describes the position and power of supermarkets in the Australian food system, and the implications for public health. A systematic search of peer-reviewed and grey literature identified sixty-eight documents that described supermarket power. Implications for public health were also recorded. Data revealed that supermarkets hold a powerful position in the Australian food system, acting as the primary gatekeepers. Supermarkets have obtained instrumental, structural, and discursive power from many sources which overlap and reinforce each other. Few positive public health impacts of supermarket power were identified, providing many opportunities for improvement in the domains of food governance, the food system, and public health nutrition. There is very little public health research examining the impact of supermarket power in Australia. More research is needed, and examination of supermarket own brands is of particular importance due to their pivotal role as a source of power and their potential to improve public health outcomes, such as obesity.

2.4.2 Introduction

Globally, supermarkets have been described as having unprecedented and disproportionate power in the food system [12]. They were first referred to as the *"new masters of the food system"* in 1992 by Flynn and Marsden, who identified the increasing role of British supermarkets in food governance due to the changing political context [234, 235], whereby neoliberalism aims to minimise the policy role of the state to promote free trade [40]. Supermarkets exercise control over all parts of the food

[1]This is the accepted version of the following article: Pulker CE, Trapp GSA, Scott JA, Pollard CM. What are the position and power of supermarkets in the Australian food system, and the implications for public health? A systematic scoping review. *Obes Rev*. 2018; 19: 198-218, which has been published in final form at https://doi.org/10.1111/obr.12635.

system [236], acting as gatekeepers between food producers and consumers by use of contracts and specifications [237]. There are concerns that this power could be financially exploited to the disadvantage of suppliers and consumers [238]. Supermarkets make decisions about the product assortment available, how they are arranged into categories, the price, promotional activity, aisle and shelf location, and point of sale merchandising, all of which influence consumer food choice [125]. However, the position and power of supermarkets has not yet been synthesised from a public health perspective, defined for the purpose of this research as the conditions needed to improve health and prevent disease in a population [64].

Supermarkets operate within the global food system which comprises a number of actors: grocery retailers including supermarket chains and independent retailers; wholesalers; and primary producers and food manufacturers [239]; as well as food service operators and government. The power of food companies, including supermarkets, has been explored in terms of food governance [47], and using a taxonomy of corporate political activity [60]. The term 'food governance' is used to describe how rules or decisions within the food system are made, and by whom [62]. Clapp and Fuchs (2009) developed a conceptual framework to describe the different sources of power available to food companies including supermarkets for governance of the food system [47]. Instrumental power refers to the direct power of one actor over the decisions of another; structural power describes the ability to limit the range of choices available by agenda-setting and rule-setting; and discursive power is the capacity to use communication practices that influence societal norms and values to influence political policies and processes [47]. The different sources of power overlap and reinforce each other in complex ways [147]. In addition, Fuchs recommends that political legitimacy should be evaluated to determine whether power has been obtained democratically, using the criteria of participation, transparency and accountability [41]. Participation requires that all affected actors have access to information and decision-making; transparency refers to provision of timely, comprehensive, and reliable information; and accountability is the ability to hold actors to account [41]. The taxonomy proposed by Mialon and colleagues (2015) aimed to categorise the ways political influence is exerted by food companies to shape government policy, that potentially compromises public health [60]. It includes six main strategies: information or messaging; financial incentives; building constituency; legal action; policy substitution; and opposition

fragmentation and destabilisation [60]. These frameworks provide useful context for exploring the position and power of Australian supermarkets through a public health lens.

Food system actors including primary producers, food manufacturers, food service operators, industry trade associations and peak bodies, as well as entertainment and media companies, can influence food retail environments, in addition to supermarket chains [164]. Transnational food manufacturers have been identified as particularly influential due to high levels of concentration, whereby the largest companies control a third of the global market [164]. These manufacturers have been accused of undermining public health interventions to improve population diets in order to protect continued sales [145]. They influence population diets through their products, marketing activities, and efforts to influence government public policies [146]. They also seek to divert attention away the importance of food environments, instead placing responsibility for preventing obesity and other diet-related non-communicable diseases onto individuals [147]. However, the position and power of supermarket chains in the food system and the implications for public health is the focus of this review as it has not been previously explored.

Globally, the proportion of foods purchased from supermarkets is increasing, emphasising their influence on food provision [240]. Most Australian food purchases are made in supermarkets (62% in 2012-13) [21]. Supermarket chains in Australia and other developed countries sell a broad product range, operate large networks of stores, and manage their own supply logistics [143]. In Australia, independent supermarkets provide a similar product range to the chain supermarkets, but supply logistics are managed by a national wholesaler [143]. It is important to note that supermarkets are not homogenous [12], and the products and services available may differ by store. There is greatest consistency for major supermarket chains which are managed from central support offices, and they provide the focus for this study.

Concentration of grocery sales into the hands of few supermarket chains has taken place in many developed countries [236], and has been associated with increased power [237]. The two largest Australian chains, Coles and Woolworths, account for 70% of grocery sales [124], one of the highest levels of supermarket concentration globally [23]. High levels of supermarket concentration are also evident in countries such as New

Zealand [16], Austria, Canada, Denmark, Germany, France, Spain, and the United Kingdom (UK) [23]. Some of the factors thought to contribute to the high level of supermarket concentration in Australia, include: concentration of the population in urban centres, which encourages development of large metropolitan supermarkets; long distances between food producing areas and widely dispersed urban centres, which require effective distribution networks; and the economies of scale required to remain profitable given the relatively small population size [241]. The dominance of two supermarket chains in food provisioning in Australia emphasises the need to understand their position and power in the food system, and the potential implications for foods available for consumption.

Globally, large supermarket chains have extended their operations beyond retailing into manufacture, by introducing supermarket own brands [26]. Supermarket own brands (also known as private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers, wholesalers or distributors and are sold privately in their own stores [27]. The UK, Spain and Switzerland have the highest proportion of supermarket own brand products, where they account for up to forty-five percent of national grocery sales [26, 126]. Sainsbury UK reported own brands contributing over half of all sales in 2014 [127]. In Australia, supermarket own brand sales are growing and are predicted to reach thirty-five percent of grocery sales by 2020 [124]. The success of supermarket own brands is typically at the expense of small and medium sized brands [126]. For example, supermarkets can use their power to allocate prominence to their own brands at the expense of branded products [134, 242]. Little is known about implications of supermarket own brand development for public health.

There is increasing evidence that supermarkets contribute to food choices and diet [9, 11, 80]. Poor diet is one of the most important risk factors for early deaths globally [2], and healthy retail food environments hold the potential to reduce obesity, non-communicable diseases, and their inequalities [66]. A New Zealand study found that nutrient-poor extensively processed, or 'ultra-processed' foods [67] were the most widely available foods in a sample of supermarkets [243]; and a Norwegian study found ultra-processed foods contributed over half of supermarket sales [244]. Assessments of Australian supermarket environments have found that less than half of packaged foods could be classified as healthy [16]; snack foods (e.g. crisps and confectionery) were prominently displayed at highly visible supermarket locations such as checkouts and

ends-of-aisles [14, 15]; and food packaging designed to appeal to children was widespread [17, 85, 86]. As public health interventions in supermarket settings are generally effective in increasing purchases of targeted healthy foods [18, 19], policies and practices to improve placement, promotion, pricing, and availability of healthy foods hold potential to improve health outcomes, including obesity.

In order to create supermarket environments supportive of healthy choices, an understanding of supermarkets' position and power in the food system, and the public health implications, is needed. A scoping review is a useful way of mapping the existing literature on a topic to identify key concepts, theories, and sources of evidence. Scoping reviews can identify and synthesise research findings and gaps in the existing literature [180], or explore the extent of the literature without reporting the findings in detail [245]. This scoping review provides an overview of supermarket power using a public health lens. The overall aim was to identify and synthesise the literature that describes the position that supermarkets occupy in the Australian food system including their power and influence over other actors; identify gaps in knowledge; make recommendations for future research; and identify the implications for public health.

2.4.3 Methods

This scoping review was conducted by following the protocol described by Arksey and O'Malley and others [180-182]. Five steps included: define the research question; identify relevant studies; select studies to include; chart the data, whereby data is extracted and synthesised; and summarise and report the results [180-182]. The overall aim was addressed by a two-part research question: (a) What is known from the existing literature about the position Australian supermarkets occupy in the food system, including their power and influence over other actors, e.g. growers, food manufacturers, government? (b) What are the potential implications of the position and power of Australian supermarkets for public health? Public health implications of supermarket power were classified into three domains of (1) food governance, including influencing policy and setting rules; (2) the Australian food system, including influencing livelihoods and communities; and (3) public health nutrition, including influencing determinants of health that relate to a safe, nutritious, affordable, accessible, secure, and environmentally sustainable food system[65].

2.4.3.1 Search strategy

A search strategy was developed to identify relevant studies. Topics relating to the key concepts of the primary research question were identified as: supermarkets, governance and power, food system, and Australia. Searches were conducted in September 2016 using the following databases: Medline (Ovid), ProQuest, Informit, IBISWorld, and Business source complete; and grey literature including government websites, and company websites. Search terms for each of the concepts are listed in Table 2.6. Results were limited to English language documents, published between 1980 and 2016. Grey literature was obtained by searching Australian government websites (Health, Agriculture, Commerce) for relevant reports, and Google using combinations of the search terms supermarket, power, and governance. Hand searching and snowball searches of the references and citations of selected documents continued until December 2016.

Table 2.6 Search terms used for each of the concepts

Concept	Search terms
Supermarkets	supermarket* OR “food retail*”
Governance and power	authorit* OR concentrat* OR control OR domina* OR "food governance" OR "food polic*" OR legitima* OR "non*state actor*" OR power OR "private regulation*" OR "self regulation" OR "private standard*" OR regulat* OR restructur* OR trust OR "voluntary standard*" OR "corporate political activit*" OR "corporate social responsibilit*" OR "corporate responsibilit*" OR "shared value*" OR CSR OR partnership OR code
Food system actors	“agr*food chain*” OR agr*business OR “food system*” OR “food chain*” OR “food corporation*” OR “food* industry” OR “food supply*” OR “supply chain*” OR “food manufactur*” OR “food process*”
Australia	Australia OR Victoria OR “New South Wales” OR Queensland OR “Northern Territory” OR “Western Australia” OR “South Australia” OR “Australian Capital Territory” OR Tasmania OR Melbourne OR Sydney OR Brisbane OR Darwin OR Alice Springs OR Perth OR Adelaide OR Canberra OR Hobart

2.4.3.2 Study selection

All types of documents (e.g. peer-reviewed papers, articles, reports) were reviewed for relevance to the primary research question. The titles and abstracts of documents identified through database, snowball, and hand searching were assessed against the inclusion and exclusion criteria defined in Table 2.7, to select documents for further screening. Full text was downloaded to EndNote X7 citation management software (Thomson Reuters, Philadelphia, PA, USA) then reviewed prior to final selection of documents for inclusion. The titles and executive summaries of grey literature were similarly assessed against the inclusion and exclusion criteria, before downloading the full text for review. This scoping review included documents with a focus on food and non-alcoholic beverages and excluded documents that only addressed alcohol, tobacco, or gaming.

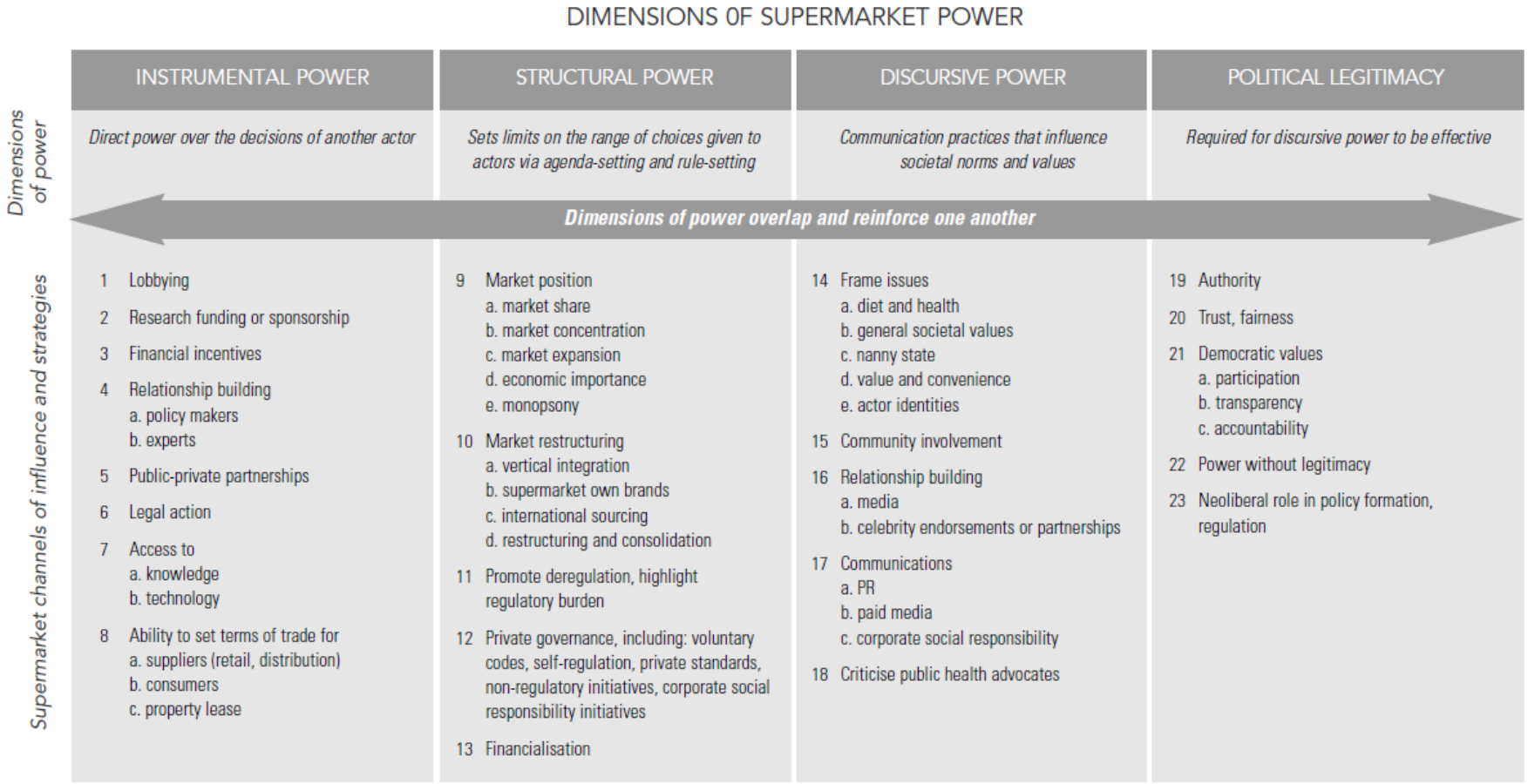
Table 2.7 Inclusion and exclusion criteria

	Inclusion criteria	**Exclusion criteria**
Language	English	All other languages
Year	1980+	<1979
Country	Australia, international studies with relevance to Australia	International studies without relevance to Australia
Population	Humans	Animal
Exposure	Supermarket	Not supermarket
Outcomes of interest	Referred to sources of supermarket power, or supermarket private governance of the food system	No reference to sources of supermarket power or supermarket private governance; theoretical work with no analysis of the Australian food system
Supermarket products	All food and non-alcoholic beverages	Alcohol, tobacco, gaming only, without reference to food and non-alcoholic beverages
Publication type	Journal articles, book chapters, government reports, non-government organisation reports, academic reports, industry reports, market research or report, government initiatives, industry submission documents	Opinion pieces

2.4.3.3 Data synthesis

The data from selected documents was charted to enable synthesis and to identify themes. A framework of the dimensions of power and influence was constructed (Figure 2.3), adapted from the work of Clapp and Fuchs [47] and Mialon et al [60]. Reference to any aspect of the framework was recorded for each document. Evidence of how supermarket power impacts public health was also recorded for each document in the three domains of food governance, food system, and public health nutrition. A second reviewer (C.M.P.) extracted data from approximately 10% of the documents and any disagreements on classification regarding the dimensions of power and influence, or the public health implications, were discussed and resolved.

Figure 2.3 Framework of the dimensions of supermarket power and influence#

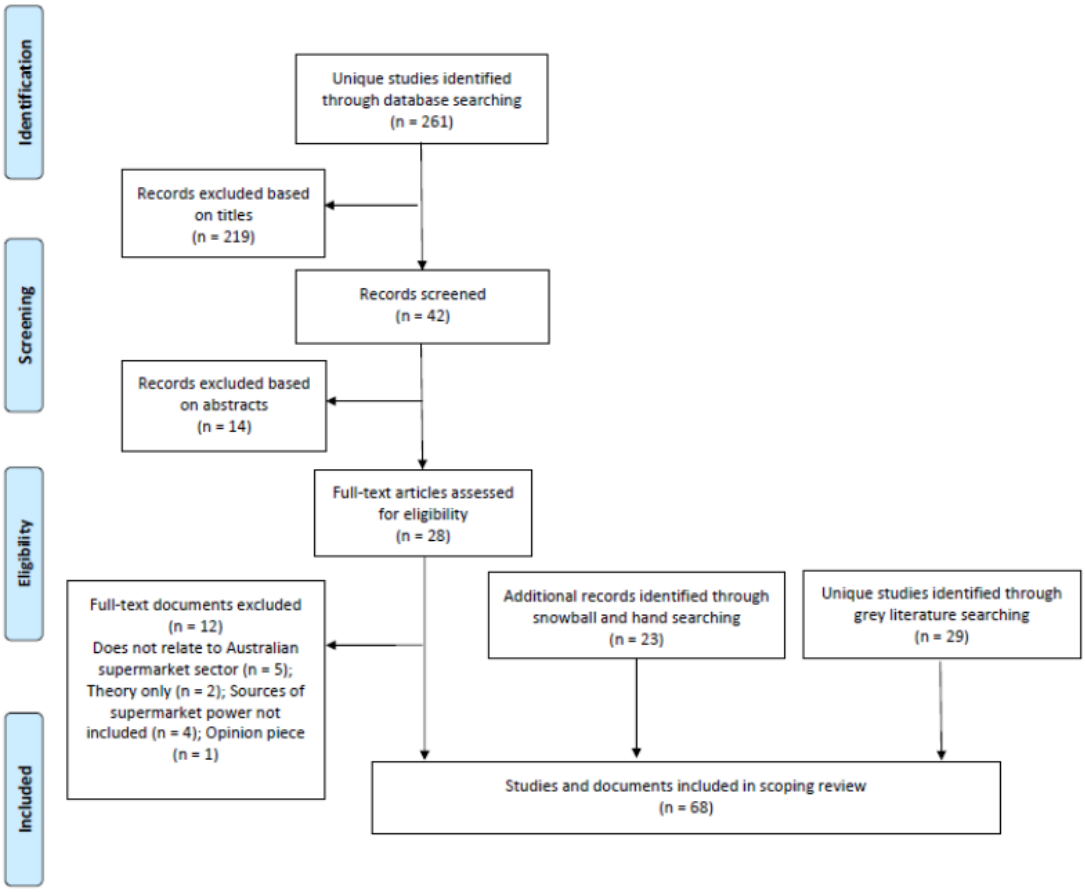


Adapted from the work of Clapp and Fuchs [47] and Mialon et al. [60]

2.4.4 Results

For the final stage of the scoping review, a summary of the extent, nature, and distribution of the studies is given. The database search strategy identified 261 unique documents. After screening titles and abstracts, the full text of 28 documents was assessed for eligibility based on the inclusion and exclusion criteria, and 16 were selected. In addition, 23 documents were identified using snowball searching of citations and references, and hand searching. A further 29 documents were identified by searching grey literature, giving a total of 68 documents included in the scoping review (Figure 2.4).

Figure 2.4 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of included documents



2.4.4.1 Nature of the evidence base

A wide range of documents were reviewed, including 39 peer-reviewed papers [11, 12, 24, 25, 41-43, 57, 123, 146, 241, 246-273], seven government reports [120, 143, 274-278], five book chapters [235, 279-282], five market research or market reports [124, 283-286], three investigative articles [287-289], three lobby or industry submission documents [239, 290, 291], two industry reports [292, 293], two government initiatives [294, 295], one non-government organisation report [23], and one academic report [296].

These documents were published in a wide range of study disciplines, with the highest number relating to food policy or food systems (20/68) [41, 42, 143, 239, 241, 251-253, 255-259, 263, 264, 271, 278-280, 282]. In addition, seven documents each related to competition law [274, 275, 289-291, 293, 296], retailing [57, 120, 124, 250, 277, 283, 292], and governance [23, 43, 254, 267, 276, 281, 287]; there were six sociology and political science studies [24, 248, 249, 261, 262, 288]; four each related to business [123, 284-286], agriculture or agricultural economics [247, 266, 269, 270], and public health [146, 272, 294, 295]; three documents related to rural society or communities [235, 246, 265]; there were two marketing studies [25, 260]; and one each relating to preventive medicine [11], international development [12], labour relations [273], and geography [268].

Unsurprisingly, most documents (57/68) were written by an Australian first author [24, 25, 42, 43, 120, 123, 124, 143, 146, 235, 239, 241, 246-253, 257, 259-280, 284, 286-297]. However, there were a number of documents published by authors from outside of Australia: five from Germany [41, 57, 254, 255, 281], three from the United States (US) [11, 12, 258], two from the UK [23, 283], and one from France [256].

Only two documents made a statement that there was no conflict of interest [146, 268]. Most documents did not state the source of funding. Of the documents that did make a statement, most (11/68) received Australian Research Council funding [24, 42, 235, 249, 251, 253, 259, 263-265, 271], with overseas institutions funding three studies [12, 23, 42], industry or an industry group funding two studies [239, 296], and one study each receiving funding from the Australian National Health and Medical Research Council [146] and an Australian university [273].

Most of the documents (43/68) applied a framework or theory to the work reported. Economic theory was applied by seven documents [239, 258, 266, 270, 274, 277, 278], with an additional four documents referring to buyer/ seller/ retail power [23, 25, 250, 289], three

specifically referring to anti-trust or anti-competitive conditions [241, 267, 296], and two referring to market power [120, 292]. The framework for conceptualising corporate power in food governance [47] was referred to by nine studies [41, 42, 57, 123, 251, 254, 255, 265, 281]. In addition, food regimes theory [298] was referred to by five documents [247, 248, 253, 269, 282]; and three documents referred to multiple frameworks or theories [24, 43, 252]. Authority or trust were the focus of three documents [264, 271, 280]; and one document each referred to 'Big Food' which describes dominant food businesses [279], an ecological framework of the influences on food choice [7, 12], the process of supermarket domination or 'supermarketisation' [235], global value chain analysis which identifies how supply and demand can be influenced [257], the regulatory network analysis approach to policy analysis[262], corporate political activity[146], and systemic power or the power of one actor over the whole system of another actor[260].

2.4.4.2 Sources of supermarket power

All documents reported at least one aspect of supermarket power (i.e. instrumental, structural, discursive, and political legitimacy) to meet the inclusion criteria. The frequency of referring to an aspect of supermarket power over time is shown in Figure 2.5. The year of publication of the documents ranged from 1999 to 2016, with the majority (40/68) published from 2012 onwards [11, 23-25, 42, 43, 123, 124, 143, 146, 235, 241, 249, 251, 253, 257, 259, 261-263, 265, 267, 268, 271, 275, 278, 279, 283-295, 297]. Table 2.8 shows document references to instrumental, structural, and discursive sources of supermarket power, and political legitimacy.

Figure 2.5 Documents referring to instrumental, structural, and discursive sources of supermarket power, and political legitimacy

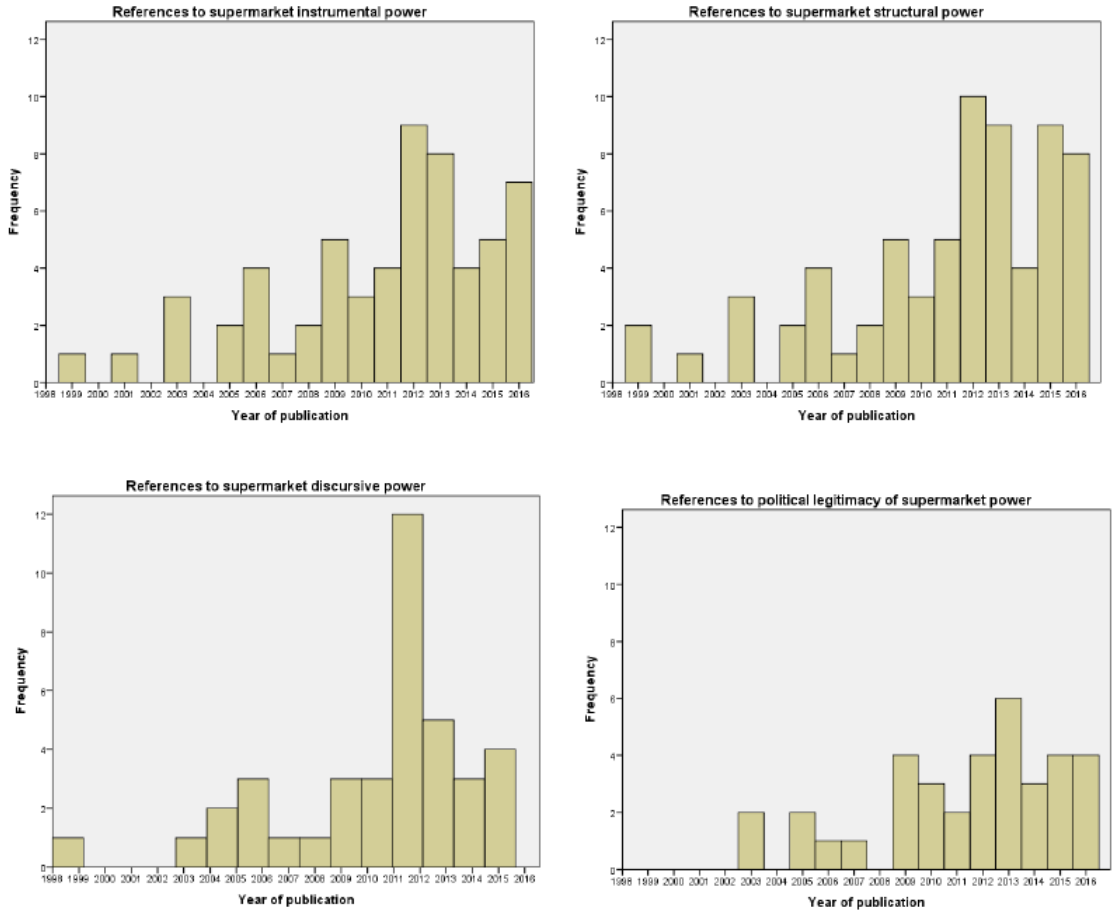


Table 2.8 Document references to instrumental, structural, and discursive sources of supermarket power, and political legitimacy in Australia

First author (year)	Instrumental power	Structural power	Discursive power	Political legitimacy
ACCC (2008) [274]	8 (a)	9 (a,b,c,d), 10 (a,b)	-	-
ACCC (2016) [275]	8 (a)	10 (a,d), 12	-	-
Blewett N (2011) [276]	-	9 (b), 12	14 (e)	-
Booth S (2015) [279]	8 (a)	9 (a,b,c), 10 (a,b,c,d)	-	20, 22
Burch D (1999) [246]	-	9 (a,b,d), 10 (b,c,d)	-	-
Burch D (2005) [247]	8 (a,b)	9 (b), 10 (a,b,c,d), 12	14 (a,b,d), 17 (b)	19
Burch D (2009) [248]	8 (a)	9 (c), 10 (b,c,d), 13	-	23
Burch D (2013) [24]	-	9 (a,b), 10 (a,b,c,d), 12	14 (b,d)	20, 22, 23
Burch D (2013) [249]	8 (a)	9 (a,b,d), 10 (b,c), 12	-	23
Cameron A (2013) [287]	4 (b)	9 (b,d), 12	14 (b)	-
Dapiran GP (2003) [250]	7 (a,b), 8 (a)	9 (a,b), 10 (b)	-	20, 23
Davey SS (2013) [251]	4 (a), 8 (a)	9 (a,b), 12	-	21 (b,c)
Deloitte (2016) [283]	-	9 (d)	-	-
Deloitte Access Economics (2012) [292]	1	9 (a,b,c,d), 10 (a,b,c), 12	14 (d,e)	-
DAFF (2012) [143]	-	9 (a,b,c), 10 (a,b,c,d)	-	-
DoH (2012) [294]	5	9 (d), 10 (b), 12	14 (a)	19
DoH (2016) [295]	5	10 (b), 12	14 (a,b)	19, 21 (b)
Devin B (2016) [123]	8 (a)	9 (a,b), 10 (d), 12	14 (b), 17 (c)	19
Dixon J (2003) [252]	1, 2, 4 (a,b), 8 (a,b)	9 (b), 12	14 (a,b,d), 17 (a,b)	19
Dixon J (2016) [235]	7 (a)	9 (a,b,c,d,e), 10 (a,b,c,d), 12	14 (b,d), 17 (a,b)	19
Dixon J (2013) [253]	8 (a,c)	10 (c), 12	14 (b,d), 15, 17 (b)	-
Dixon J (2007) [280]	4 (b), 7 (a), 8 (a,b)	9 (a,b,c), 10 (b), 12	14 (a,b,d), 15, 16 (b), 17 (a,b,c)	19, 20
Fuchs D (2009) [57]	1	10 (b), 12	14 (b,e), 15, 16 (b), 17 (a,b,c)	19, 20
Fuchs D (2009) [41]	5, 8 (a)	12	-	21 (a,b,c), 22
Fuchs D (2010) [254]	7 (a), 8 (a,b)	9 (a,b,d), 10 (b), 12	14 (b,e), 15, 17 (a,b,c)	19, 23
Fuchs D (2009) [281]	4 (b), 7 (a,b), 8 (a,b)	9 (a,b,c), 10(a,b), 12	14 (e), 17 (a,b)	19, 21 (a,b)

First author (year)	Instrumental power	Structural power	Discursive power	Political legitimacy
Fuchs D (2011) [255]	8 (a)	9 (b), 10 (a,d), 12	17 (c)	21 (a,b,c)
Fulponi L (2006) [256]	5	9 (b), 12, 13	14 (a,e), 17 (c)	-
Glanz K (2012) [11]	8 (a)	10(b)	-	-
Hattersley L (2010) [282]	7 (a,b)	9 (b,d), 10 (a,b,c,d), 12	14 (a,b,d,e), 15, 17 (c)	20
Hattersley L (2013) [257]	8 (a)	9 (a,b), 10 (b,c,d), 11, 12	-	-
Hawkes C (2008) [12]	7 (a,b), 8 (b)	9 (a,b,c,d), 10 (a,b), 12	14 (a,b,e), 17 (c)	-
IBISWorld (2015) [286]	-	9 (a,c,d), 13	-	-
IBISWorld (2015) [284]	-	9 (a,c,d), 10 (b), 13	-	-
IBISWorld (2015) [285]	-	9 (a,c,d), 13	-	-
Jones E (2006) [296]	8 (a,c)	9 (b,c,d), 10 (a,b)	14 (b,e)	19, 22
Keith S (2012) [241]	8 (a,b)	9 (a,b,c), 10 (a,b,d), 12	14 (a,b,e), 17 (b)	-
Knox M (2014) [288]	3, 6, 7 (a), 8 (a)	9 (a,b,c,d), 10 (a,b,d), 12	16 (b)	19
Konefal J (2005) [258]	7 (a)	9 (a,b), 10 (d), 11, 12	14 (e)	19
Lewis T (2015) [259]	4 (b)	9 (b), 10 (b), 12	14 (b,e), 15, 16 (a,b), 17 (b,c)	19
MGA (2015) [293]	8 (a)	9 (a,b)	-	20
Merrett A (2012) [289]	8 (a,b)	9 (b,d,e), 10 (b)	-	-
Merrilees B (2001) [260]	7 (b), 8 (a,c)	9 (a,b,c,d), 10 (a,b,d), 12	-	-
Mialon M (2016) [146]	1, 3, 4 (a,b), 5	9 (d), 11, 12	14 (a), 15	-
Nicholson C (2012) [23]	1, 7 (a), 8 (a,b)	9 (a,b,e), 10 (b), 12	14 (e), 17 (c)	20
Parker C (2013) [261]	8 (a,b)	9 (a,b), 12	14 (b,d,e), 17 (c)	20
Parker C (2014) [43]	4 (b), 8 (a,b)	9 (b,c) 10 (a,b), 12	14 (b,d,e), 16 (b), 17 (a,b,c)	19
Parker C (2015) [262]	-	12	14 (b,d)	19, 23
Phillipov M (2016) [263]	8 (a)	9 (a,b,d), 10 (b), 12	14 (b,e), 16 (a,b), 17 (b,c)	19
Productivity Commission (2011) [277]	1, 8 (a,c)	9 (b,d), 10 (b), 11	14 (e)	-
Report by the Joint Select Committee on the Retailing Sector (1999) [120]	7 (b), 8 (a,c)	9 (a,b,c,d,e), 10 (a,b)	14 (e), 15	-
Richards C (2013) [42]	8 (a)	9 (a,b,c,e), 10 (a,b,d), 12	-	23
Richards C (2011) [264]	4 (b), 8 (a)	9 (a,b,d), 10 (b), 12	14 (b,e), 16 (b)	20, 23
Richards C (2012) [265]	7 (b), 8 (a)	9 (a,b,c,d,e), 10 (a,b,d), 12	17 (c)	23

First author (year)	Instrumental power	Structural power	Discursive power	Political legitimacy
Round DK (2006) [266]	8 (a,b)	9 (a,b,c,d,e), 10 (a,b)	-	-
Schoff P (2014) [267]	8 (a,b)	9 (a,b,c,d), 10 (a,b,d)	-	-
Select Committee on Australia's Food Processing Sector (2012) [278]	8 (a)	9 (a,b,c,d,e), 10 (a,b,c,d), 12	14 (e), 17 (b,c)	-
Singh-Peterson L (2016) [268]	8 (a)	9 (a,b), 10 (a,d)	-	-
Smith K (2010) [269]	8 (a)	9 (b), 10 (b), 12	14 (a,e)	19, 23
Smith RL (2006) [270]	7 (a), 8 (a,b,c)	9 (a,b,c,d,e), 10 (a,b)	14 (d,e), 17 (b)	-
Sutton-Brady C (2015) [25]	8 (a)	9 (a,b), 10 (b,c), 12	14 (e)	-
The Allen Consulting Group (2011) [239]	7 (a), 8 (a)	9 (d,e), 10 (a,b,c,d)	14 (b,e)	-
Thompson L-J (2012) [271]	8 (a)	10 (a,c,d), 12	14 (b), 16 (a), 17 (a)	19, 23
Tonkin B (2015) [124]	7 (a,b)	9 (a,b,c,d), 10 (a,b)	17 (a)	-
Wardle J (2009) [272]	8 (a)	9 (a,b,e), 10 (a,b)	14 (b,d)	-
Wilson T (2013) [290]	1	9 (a,b,c,d), 10 (a,b), 11	14 (d,e), 17 (b)	23
Woolworths Ltd (2014) [291]	1, 7 (a,b)	9 (a,b,c,d), 10 (b,c), 11, 12	14 (d,e), 15, 17 (b)	23
Wright C (2003) [273]	7 (a,b), 8 (a,b)	9 (a,b,e), 10 (a,b,d), 11	-	-

Footnote: ***Instrumental power*** 1. Lobbying; 2. Research funding or sponsorship; 3. Financial incentives; 4(a). Relationship building, policy makers; 4(b). Relationship building, experts; 5. Public-private partnerships; 6. Legal action; 7(a). Access to knowledge; 7(b). Access to technology; 8(a). Ability to set terms of trade for suppliers (retail and distribution); 8(b). Ability to set terms of trade for consumers; 8(c). Ability to set the terms for property lease; ***Structural power*** 9(a). Market share; 9(b). Market concentration; 9(c). Market expansion; 9(d). Economic importance; 9(e). Monopsony (buyer power); 10(a). Vertical integration; 10(b). Supermarket own brands; 10(c). International sourcing; 10(d). Market restructuring and consolidation; 11. Promote deregulation or highlight regulatory burden; 12. Private governance e.g. self-regulation, private standards, CSR; 13. Financialisation; ***Discursive power*** 14(a). Frame issues - diet and health; 14(b). Frame issues - societal values; 14(c). Frame issues - nanny state; 14(d). Frame issues - value and convenience; 14(e). Frame issues - actor identities; 15. Community involvement; 16(a). Relationship building – media; 16(b). Relationship building - celebrity endorsements; 17(a). Communication – PR; 17(b). Communication - Paid media; 17(c). CSR communications; 18. Criticise public health advocates; ***Political legitimacy*** 19. Authority; 20. Trust, fairness; 21(a). Democratic values – participation; 21(b). Democratic values – transparency; 21(c). Democratic values – accountability; 22. Power without legitimacy; 23. Neoliberal role in policy formation/ regulation

Instrumental power

Supermarkets have obtained instrumental power, or direct power over the decisions of other actors, by: lobbying; providing research funding or sponsorship; giving financial incentives; building relationships with policy makers and experts; contributing to public-private partnerships (PPP); taking legal action; having access to knowledge, access to technology; and the ability to set terms of trade for suppliers, consumers, and for property lease. The ability of supermarkets to set the terms of trade for suppliers was the most commonly reported source of supermarket instrumental power (44/68) [11, 23, 25, 41-43, 120, 123, 239, 241, 247-255, 257, 260, 261, 263-275, 277-281, 288, 289, 293, 296].

Structural power

Structural power has been obtained by supermarkets by setting limits on the range of choices given to other actors by agenda-setting and rule-setting activities. Aspects of supermarket structural power include: high market share; high levels of market concentration whereby few companies command a high proportion of supermarket sales; market expansion, i.e. expansion into new markets; emphasising economic importance; monopsony, or buyer power, which occurs when a large number of sellers access the market via a small number of retailers; vertical integration whereby previously separate parts of the supply chain such as production, distribution, and retailing are integrated; development of supermarket own brands; international product sourcing; market restructuring and consolidation of other actors within the food system e.g. smaller producers being purchased by larger producers; promotion of deregulation and highlighting regulatory burden; private governance e.g. self-regulation, private standards, and corporate social responsibility (CSR) initiatives; and financialisation whereby financial institutions become primary shareholders of supermarkets. The structural aspect of supermarket power was most frequently referred to, with high market concentration (53/68) [12, 23-25, 42, 43, 120, 123, 124, 143, 146, 235, 241, 246, 247, 249-252, 254-261, 263-270, 272-274, 276-283, 287-291, 293, 296], development of supermarket own brands (48/68) [11, 12, 23-25, 42, 43, 57, 120, 124, 143, 235, 239, 241, 246-250, 254, 257, 259, 260, 263-267, 269, 270, 272-274, 277-282, 284, 288-292, 294-296], and private governance of the food system by supermarkets (43/68) [12, 23-25, 41-43, 57, 123, 146, 235, 241, 247, 249, 251, 253-257, 259-265, 269, 271, 275, 276, 278, 280-282, 287, 288, 291, 292, 294, 295] mentioned the most

.

Discursive power

Discursive power has been obtained by supermarkets via communication practices that influence societal norms and values, including: framing issues around diet and health, societal values, value and convenience, and food system actor identities; community involvement; building relationships with media, and celebrity endorsements; and communication practices via public relations (PR), paid media or advertising, and CSR reporting. The aspects of discursive power referred to most often by the documents included framing issues around actor identities (26/68) [12, 23, 25, 43, 57, 120, 239, 241, 254, 256, 258, 259, 261, 263, 264, 269, 270, 276-278, 281, 282, 290-292, 296] and societal values (25/68) [12, 24, 43, 57, 123, 235, 239, 241, 247, 252-254, 259, 261-264, 270-272, 280, 282, 287, 295, 296].

Political legitimacy

Some documents included reference to the political legitimacy of supermarket power, i.e. whether their power has been obtained democratically via the attributes of participation, transparency and accountability [41]. Supermarkets have obtained political legitimacy for their power by other means including: authority; trust or fairness; and the neoliberal role in policy formation and regulation, whereby the policy role of government is minimised to promote free trade. In some instances, supermarkets have gained power without legitimacy. Political legitimacy of supermarket power was referred to the least by the scoping review documents. Authority (19/68) [43, 57, 123, 235, 247, 252, 254, 258, 259, 262, 263, 269, 271, 280, 281, 288, 294-296] and the neoliberal role in policy formation and regulation (13/68) [24, 42, 248-250, 254, 262, 264, 265, 269, 271, 290, 291] received the most attention.

2.4.4.3 Implications for public health

This scoping review found evidence of how supermarket power impacts public health in the three domains of food governance, the food system, and public health nutrition (Table 2.9). Only five documents did not refer to any of these implications [248, 250, 276, 283, 293]. Overall, few (6/46) positive impacts were identified, and most were negative (21/46). There were some impacts classified as 'both positive and negative' (19/46), demonstrating the opportunity for supermarket power to be used positively or negatively, e.g. determining nutrients in supermarket own brand foods (Figure 2.6).

Table 2.9 Document references to public health impacts of supermarket power

First author (year)	Public health nutrition							Food governance	Food system
	Food safety and quality	Nutritional quality	Food cost and affordability	Accessibility	Food preferences	Sustainability	Availability		
ACCC (2008) [274]	-	-	-	-	17	-	-	-	46
ACCC (2016) [275]	1	-	-	-	-	-	-	-	36
Blewett N (2011) [276]	-	-	-	-	-	-	-	-	-
Booth S (2015) [279]	-	-	-	-	-	-	23	30, 34	36, 46
Burch D (1999) [246]	5	7	12	-	15	-	-	-	37, 46
Burch D (2005) [247]	1, 3	-	-	-	15	-	23, 25	30, 35	36, 41, 45
Burch D (2009) [248]	-	-	-	-	-	-	-	-	-
Burch D (2013) [24]	1	7, 9	10	13	15	-	23, 25	27, 30, 31, 32, 35	36, 39
Burch D (2013) [249]	1, 2	-	11	-	-	-	25	29, 31	39
Cameron A (2013) [287]	-	6,7	11		15	18, 22	-	26, 32	36, 46
Dapiran GP (2003) [250]	-	-	-	-	-	-	-	-	-
Davey SS (2013) [251]	1, 4	-	-	-	-	-	-	30, 31	39, 46
Deloitte (2016) [283]	-	-	-	-	-	-	-	-	-
Deloitte Access Economics (2012) [292]	1	-	10, 11, 12	-	-	-	-	30	46
DAFF (2012) [143]	-	-	12	-	-	-	-	30	36, 45
DoH (2012) [294]	-	9	-	-	-	-	-	27	-
DoH (2016) [295]	-	-	-	-	-	-	-	26, 27	-

First author (year)	Public health nutrition								
	Food safety and quality	**Nutritional quality**	**Food cost and affordability**	**Accessibility**	**Food preferences**	**Sustainability**	**Availability**	**Food governance**	**Food system**
Devin B (2016) [123]	1	-	-	-	-	18, 19, 20	-	-	-
Dixon J (2003) [252]	1	-	-	-	15	-	25	30, 35	-
Dixon J (2016) [235]	1, 2	-	10,11	-	15	-	-	-	36, 38, 39, 42
Dixon J (2013) [253]	3	6	-	-	-	-	-	26, 31	36, 38, 39, 42
Dixon J (2007) [280]	1	-	-	-	15	-	-	28, 33, 35	36
Fuchs D (2009) [57]	2, 3	9	-	-	15	18	-	26, 30, 35	-
Fuchs D (2009) [41]	1, 2, 3	-	-	-	-	18	-	32	36
Fuchs D (2010) [254]	1, 3	9	10, 11	-	15	18	-	27, 29, 30	36, 42
Fuchs D (2009) [281]	1, 3, 4, 5	-	-	-	-	18	24	29, 32	36, 39, 42
Fuchs D (2011) [255]	1, 3	-	-	-	-	18	-	32	39, 42
Fulponi L (2006) [256]	1, 4	9	-	-	-	-	-	27, 30	36
Glanz K (2012) [11]	-	8, 9	10	13, 14	-	-	-	-	-
Hattersley L (2010) [282]	1, 3, 4	6, 8, 9	10, 11	13, 14	15, 16	-	23, 25	27, 28, 31, 35	36, 38, 39
Hattersley L (2013) [257]	3	-	10	13	-	-	23	-	-
Hawkes C (2008) [12]	1, 4	6, 7, 8, 9	10, 11	13	15	-	23, 25	27, 30	36, 37
IBISWorld (2015) [286]	-	-	-	-	-	-	-	34	-
IBISWorld (2015) [284]	-	-	-	-	-	-	-	34	-
IBISWorld (2015) [285]	-	-	-	-	-	-	-	34	-

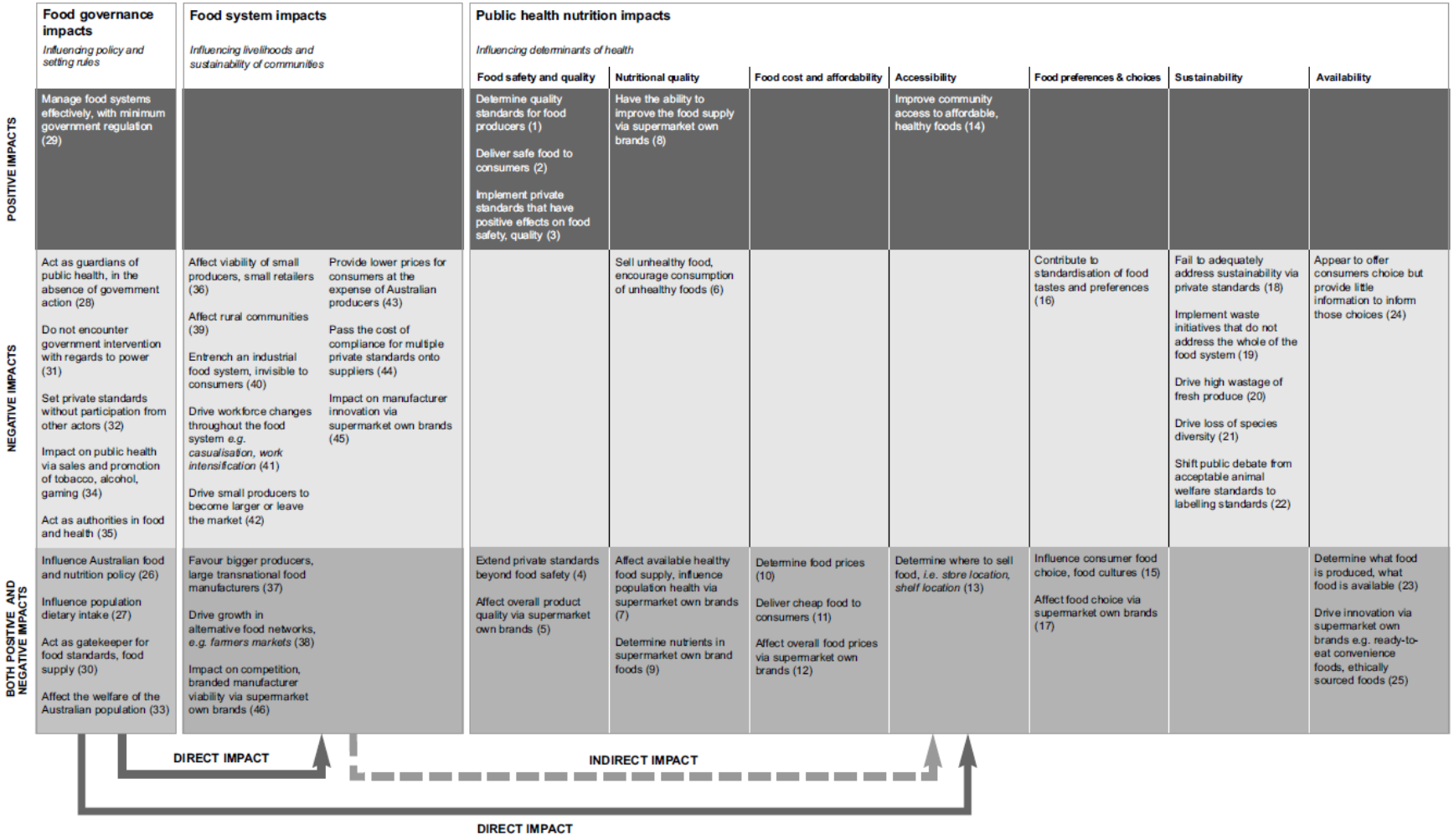
First author (year)	Public health nutrition								
	Food safety and quality	**Nutritional quality**	**Food cost and affordability**	**Accessibility**	**Food preferences**	**Sustainability**	**Availability**	**Food governance**	**Food system**
Jones E (2006) [296]	1	-	11	-	-	21	-	30	36, 39, 43, 46
Keith S (2012) [241]	1	-	10, 12	-	15	20	23	-	36, 37, 39, 40, 42, 46
Knox M (2014) [288]	1	-	10, 11	-	-	19, 20, 21	-	-	36, 42, 43
Konefal J (2005) [258]	1, 2, 4, 5	-	10	-	15	-	23, 25	27, 28, 30, 32	-
Lewis T (2015) [259]	1, 4	-	-	-	-	22	-	28, 30	-
MGA (2015) [293]	-	-	-	-	-	-	-	-	-
Merrett A (2012) [289]	-	-	12	-	15	-	-	-	43, 45, 46
Merrilees B (2001) [260]	1	-	10	-	-	-	-	-	36
Mialon M (2016) [146]	-	7	-	-	15	-	23	26, 35	-
Nicholson C (2012) [23]	1, 3, 4, 5	-	10, 11	-	15	20	23	30	36, 39, 43, 45, 46
Parker C (2013) [261]	1	-	10	-	15	18	24	-	36, 40, 42
Parker C (2014) [43]	1, 3 4, 5	8	10	-	15	22	23, 25	29, 30, 35	38, 40, 43
Parker C (2015) [262]	1, 4	-	10	-	-	22	24	-	-
Phillipov M (2016) [263]	1, 4	-	-	-	-	18, 20, 21	-	-	36, 37, 40

First author (year)	Public health nutrition								
	Food safety and quality	**Nutritional quality**	**Food cost and affordability**	**Accessibility**	**Food preferences**	**Sustainability**	**Availability**	**Food governance**	**Food system**
Productivity Commission (2011) [277]	-	-	10	-	-	-	-	34	41
Report by the Joint Select Committee on the Retailing Sector (1999) [120]	1	-	10	-	-	-	-	-	36, 39, 43
Richards C (2013) [42]	1, 4	-	10	-	-	-	-	32, 33	36, 37, 42, 44
Richards C (2011) [264]	1, 2, 4	-	-	-	-	20	24	-	38, 40, 44
Richards C (2012) [265]	1, 4	-	10	-	-	-	-	31	40
Round DK (2006) [266]	-	-	-	-	15, 17	-	23, 24	30, 33	36
Schoff P (2014) [267]	-	7	-	-	15	-	23	-	43
Select Committee on Australia's Food Processing Sector (2012) [278]	1	-	10, 12	-	15, 16	-	-	34	36, 41, 43, 44, 45
Singh-Peterson L (2016) [268]	-	-	10, 11	13, 14	-	-	-	-	39
Smith K (2010) [269]	1, 4	-	-	-	17	18	-	30, 31, 32, 35	36, 44
Smith RL (2006) [270]	1, 3	-	-	-	-	-	-	-	36, 45
Sutton-Brady C (2015) [25]	3	-	10	-	15	-	-	30, 31	44

First author (year)	Public health nutrition								
	Food safety and quality	**Nutritional quality**	**Food cost and affordability**	**Accessibility**	**Food preferences**	**Sustainability**	**Availability**	**Food governance**	**Food system**
The Allen Consulting Group (2011) [239]	-	-	10, 11, 12	-	-	-	-	33	43
Thompson L-J (2012) [271]	1	-	11	-	-	18	23	30	44
Tonkin B (2015) [124]	3	6	10, 11, 12	-	15	-	23	34	36, 43
Wardle J (2009) [272]	1, 5	-	10	-	15	-	-	27, 28, 30	43
Wilson T (2013) [290]	-	-	10, 11	13	-	-	-	-	43
Woolworths Ltd (2014) [291]	1	-	10, 11	13	-	-	25	-	-
Wright C (2003) [273]	-	-	10	13	-	-	23	-	37, 41

Footnote: 1. Determine quality standards; 2. Deliver safe food; 3. Private standards have positive effects on food safety, quality; 4. Private standards extend beyond food safety (cosmetic appearance, environment, ethical and social requirements); 5. Own brands affect overall product quality; 6. Sell unhealthy food, encourage consumption of discretionary foods; 7. Own brands affect available healthy food, influence population health; 8. Own brands present an opportunity to improve the food supply; 9. Determine nutrients in own brand foods including fat, sugar and salt; 10. Determine prices; 11. Deliver cheap food; 12. Own brands affect overall food prices; 13. Determine where to sell food, i.e. store location, shelf location; 14. Improve access to affordable, healthy foods; 15. Influence food choice, food cultures; 16. Contribute to standardisation of food tastes and preferences; 17. Own brands affect choice; 18. Private standards do not adequately address sustainability; 19. Waste initiatives do not address the whole of food system; 20. Supply arrangements drive high wastage of fresh produce; 21. Drive loss of species diversity; 22. Shifted public debate from acceptable animal welfare standards to labelling standards; 23. Determine what food is produced, what food is available; 24. Appear to offer consumers choice, but provide little information to inform those choices; 25. Own brands drive innovation e.g. ready to eat convenience foods, ethically sourced foods, gluten free; 26. Influence Australian food and nutrition policy; 27. Influence population dietary intake; 28. Act as guardians of public health, in the absence of government action; 29. Manage food systems effectively, with minimum government regulation; 30. Gatekeeper role - food standards, food supply; 31. Government does not intervene in their power; 32. Private standards are set without participation from other actors; 33. Affect the welfare of the Australian population; 34. Impact on public health via sales and promotion of tobacco, alcohol, and gambling; 35. Act as authorities in food and health; 36. Viability of small producers/ small retailers is uncertain; 37. Favour bigger producers, large transnational food manufacturers; 38. Growth in alternative food networks, e.g. farmers markets; 39. Affects rural communities; 40. Entrenched intense industrial food systems, invisible to consumers; 41. Drive workforce changes throughout the food system, e.g. casualisation, work intensification; 42. Small producers become larger or exit; 43. Lower prices for consumers come at the expense of Australian producers; 44. Suppliers bear the cost of compliance for multiple private standards; 45. Own brands impact on manufacturer product innovation; 46. Own brands impact on competition, branded manufacturer viability

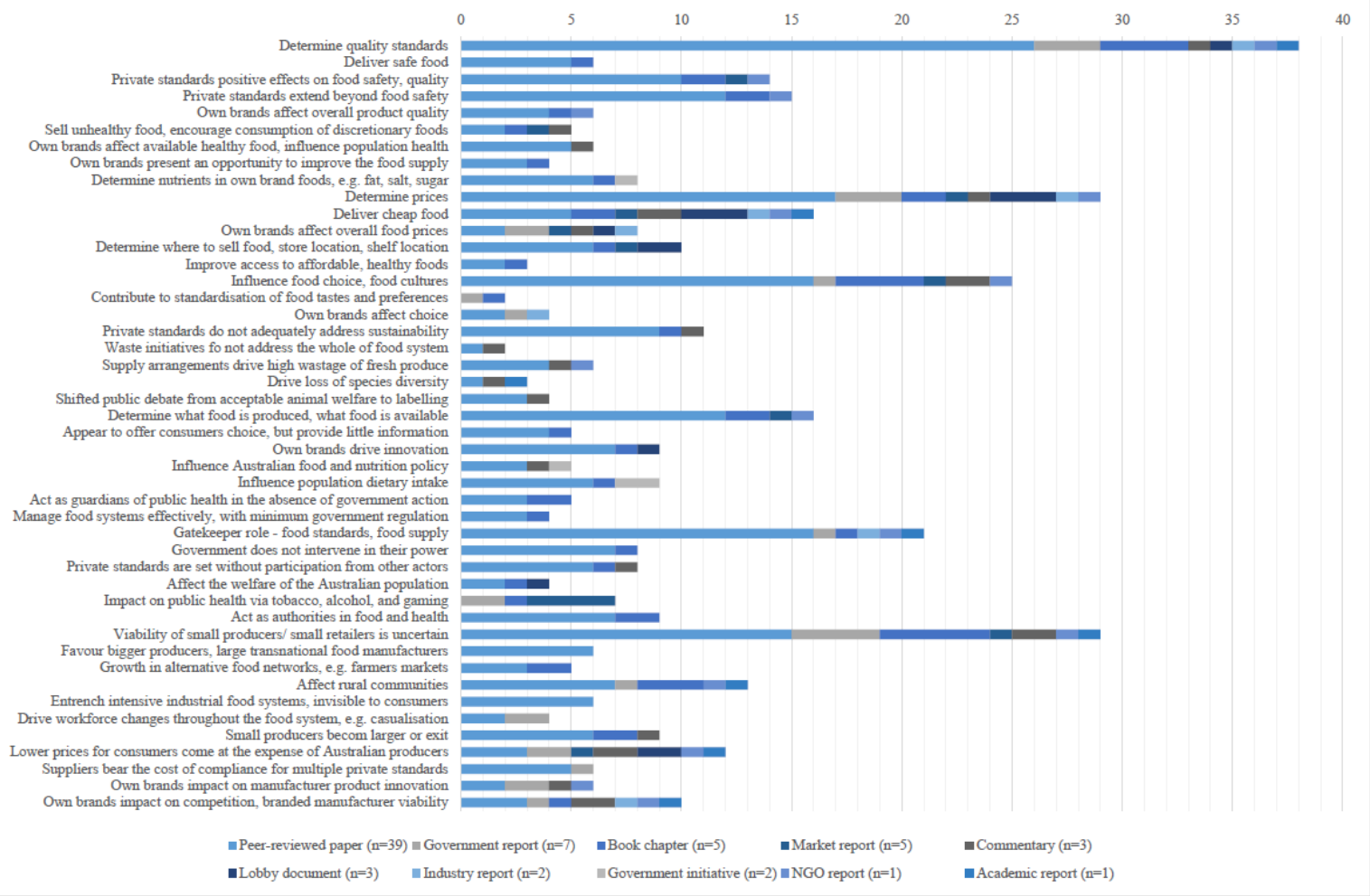
Figure 2.6 Evidence of how supermarket power impacts public health



2.4.4.4 Nature of the evidence on public health implications

The frequency of documents referring to the public health implications by type of scoping review document is shown in Figure 2.7. Peer-reviewed papers referred to all of the public health implications, apart from: supermarkets' contribution to the standardisation of food tastes and preferences, instead this information was extracted from a government report (1/7) [278] and a book chapter (1/5) [282]; and supermarkets' impact on public health via sales and promotion of tobacco, alcohol and gaming, which was extracted from two government reports (2/7) [120, 278], a book chapter (1/5) [279], and four market reports (4/5) [124, 284-286]. Interestingly, the industry reports and lobby documents identified some public health implications of supermarket power, including supermarkets determine quality standards for food producers (2/5) [291, 292]; supermarkets determine food prices (4/5) [239, 290-292]; supermarkets deliver cheap food to consumers (4/5) [239, 290-292]; and supermarket own brands affect overall food prices (2/5) [239, 292]. Public health documents [146, 272, 294, 295] did not refer to the accessibility or sustainability aspects of public health nutrition impacts of supermarket power (Table 2.9).

Figure 2.7 Number of documents referring to the public health implications of supermarket power, by document type



2.4.5 Discussion

This scoping review aimed to identify and synthesise the peer-reviewed and grey literature that describes the position that supermarkets occupy in the Australian food system, including their power and influence over other actors, and the implications for public health. The review included a wide range of types of documents, across a large number of disciplines. Documents were published between 1999 and 2016, with most written by a first author located in Australia. The potential sources of supermarket power were mapped in a framework (Figure 2.3), and sources of instrumental, structural, and discursive power were identified from the scoping review documents, along with evidence of political legitimacy. In addition, the implications of supermarket power for food governance, the food system, and public health nutrition were identified from scoping review documents. By summarising the diverse literature in this review, researchers and policy makers should gain an understanding of the sources of Australian supermarkets' power, and the far reaching implications for public health.

2.4.5.1 Supermarket instrumental power

Ability to set the terms of trade for suppliers

The aspect of supermarket instrumental power that received the most attention by scoping review documents was their ability to set the terms of trade for suppliers. The food governance role of supermarkets enables them to set the terms of trade for suppliers by using voluntary private standards that are required to be met [258]. These private standards can be used to determine who the food producers are, where they are located, and the conditions of production [258]. Food producers allow supermarkets to control many management decisions, in order to secure sales [271]. For example, primary food producers are uncertain of whether fresh produce will be accepted until it reaches the supermarket distribution centre, where it is graded and can be rejected [123]. If rejected, the producers have to accept the produce back, and either repack it before it can be sold via wholesale markets, or dispose of the waste [123]. Concerns about the effects of supermarket power over suppliers has been a factor considered by a number of government investigations into the food and grocery industries [120, 274, 275, 277, 278], but academic analysis has challenged whether the issue had been coherently examined [296].

Government intervention in the process could be considered a risk to suppliers and consumers due to the complex nature of buying and retailing [23].

2.4.5.2 Supermarket structural power

The structural power of supermarkets received the most attention by the scoping review documents, including high market concentration, development of supermarket own brands, and private governance of the food system by supermarkets. For example, the process of 'supermarketisation', or supermarket domination of the food system, was described as having six stages starting with concentration of grocery sales by a small number of supermarket chains, leading to monopsony conditions where many suppliers compete for space on the shelves of few supermarket chains [235]; thus controlling access to consumers [25]. Other stages of supermarketisation included implementation of supermarket private standards, and development of supermarket own brand products [235].

Market concentration

The high concentration of supermarkets has been considered by Australian government reviews of the sector. For example, the 2008 inquiry into the competitiveness of grocery retail prices concluded that supermarkets Coles and Woolworths, and wholesaler Metcash, had significant power as a result of many suppliers having few alternatives to dealing with them [274]. Supermarket power derived from concentration allowed them to set terms of trade for suppliers, such as reducing prices paid, delaying payments, and passing the costs associated with quality auditing and price promotions down the supply chain [43]. Concentration of the supermarket sector has also been identified as a condition for proliferation and success of supermarket own brands [26], and can force food system actors (e.g. suppliers, government) into acceptance of supermarket private governance [251]. These examples show the complexity of supermarket sources of power, which overlap and reinforce each other [147].

Supermarket own brands

Development of supermarket own brands was referred to by many scoping review documents. Some of the practical benefits of own brands to supermarkets include more efficient production, lower costs for product development and advertising [12], and

increased profits [246]. The own brands allow supermarkets to exert more control over supply chains, as they become vertically integrated with food production [282]. Development of own brands also provides supermarkets with power over suppliers by strengthening their bargaining position [239], and provides valuable information about food production which strengthens their knowledge about the supply base [235]. Supermarkets can introduce more flexible sourcing strategies for own brands, for example importing product from international manufacturers [249]. Supermarkets utilise own brands to leverage power over consumer choices by using them as a brand switching device [235], to differentiate themselves from competitor supermarkets [43], and to develop consumer trust and loyalty [282]. Indeed, the 2008 government inquiry reported that over eighty percent of consumers had bought supermarket own brand products [274], and own brands are predicted to reach thirty-five percent of grocery sales by 2020 [124]. Supermarket own brands play a pivotal role in supermarkets' power over the food system according to the documents in this scoping review (see **Error! Reference source not found.**).

Private governance

Supermarket private governance of the food system is another important mechanism that manifests and extends their power [281]. Supermarket governance typically takes the form of quality standards that food producers are required to meet in order to achieve supplier status with each supermarket. The private standards are described as reflecting supermarkets' interests of reputation management and product marketing [41]; and are used to set rules about acceptable food safety, product quality, cosmetic appearance of fresh produce, environmental management practices, and ethical practices such as fair trade and organic [251]. In addition, supermarkets set packaging requirements for fresh produce suppliers [25]. Supermarket private standards are more stringent than government food safety standards, and are not streamlined, which means suppliers have to comply with numerous standards and meet the costs of third party auditing [42]. Aspects of private standards concerned with the sustainability attributes of animal welfare, ethical trade, and environmental credentials allow supermarkets to extend their governance role [251]. Private governance has given supermarkets control of the safety, quality, and sustainability of the food system which affects the public health of all consumers [255]; and many significant decisions regarding public health have been made by supermarkets [258]. Supermarket CSR initiatives in other countries

have included reformulating supermarket own brand products to reduce saturated fat, sugars, salt [24]; and developing healthy lines of supermarket own brand products [12]. However, supermarkets still place the responsibility for making healthy choices onto consumers, limiting the impact of their CSR initiatives [12]. Private governance by supermarkets over the rest of the food system has received a great deal of attention by the documents in this scoping review, reflecting the far-reaching consequences of this source of power.

2.4.5.3 Supermarket discursive power

Framing issues around societal values

Supermarkets obtain discursive power by utilising marketing and communication practices that influence societal norms and values, including framing issues around societal values, and actor identities. Supermarkets' framing of societal values included encouraging new ways of consumer thinking about food and shopping. For example, they communicated what a 'proper meal' should be by working with celebrity chefs to promote ready-to-eat foods [252], contributing to the erosion of consumers spending time preparing meals [282]. Supermarkets have adopted the local references used by rural food producing communities, in an attempt to establish themselves [253]. Supermarkets have framed the introduction of animal welfare standards across own brands as providing better tasting products for consumers, downplaying the values of high animal welfare [259]. At the same time, they have successfully argued for weakened standards, such as for free range eggs, in order to keep costs down and achieve low prices [262].

Framing issues around actor identities

Supermarkets have framed issues around actor identities, including their own. Communications campaigns have presented supermarkets as guardians of the consumer, efficient actors in the food system, and efficient and effective in design and implementation of private standards [281]. Supermarkets have attempted to address negative consumer perceptions about their size and scale by creating a new marketplace layout and design, and providing more information about locally grown fresh produce [241]; and creating marketing campaigns that emphasise individual farmers and their families, rather than large industrial producers [263]. Similarly, supermarkets

have used communications campaigns to promote low prices, to influence consumer perceptions of their price competitiveness [270]. Coles have described their consumer-focused role as a 'bundling service' whereby they source a wide range of products from suppliers and sell them in supermarkets as a convenience to consumers [292]. Woolworths similarly describes the benefits of increasing supermarket concentration for Australian consumers, which has resulted in large modern supermarkets which deliver value, choice, and convenience [291]. The main theme of Australian supermarkets' defence when described as dominant in the food system, is that they are good for consumers [296].

Framing the identities of other food system actors, supermarkets have argued that the state does not always have the capacity to set standards, or their processes are too slow, which is why supermarkets are more effective at setting private standards [258]. Woolworths described the reasons for small retailers failing, including financial mismanagement, lack of business skills or capital, and general economic conditions [120]. Coles framed the future of Australian food processors within the overall decline of manufacturing in developed countries, stating they needed to invest in export capacity, new products, quality improvements, and increased production efficiency, or relocate off-shore [239]. These issues demonstrate the complex ways that supermarket power derived from framing issues serves to promote their food governance role, with supermarket standards regarded by many as positive for the food system [281].

2.4.5.4 Legitimacy of supermarket power

Authority status

Political legitimacy of supermarket power has been obtained via their authority status. Supermarkets' power over the food system has been granted on the basis of consumers and government not challenging and therefore accepting their legitimacy, despite the fact they are unelected rule-makers [254]. Supermarkets have gained this authority by consistently delivering fresh, safe food to consumers, and by supporting consumers' busy lifestyles via increased availability of ready-to-eat foods [247]. Invitation to participate in government initiatives such as the Food and Health Dialogue [294] and the Healthy Food Partnership [295] serves to reinforce supermarkets' authority status; as does their association with credible health experts such as the Dietitian's Association of

Australia and the Heart Foundation [252]; and animal welfare organisations such as the RSPCA [259].

2.4.5.5 Gaps in information and research recommendations

The scoping review revealed sources of Australian supermarket power and legitimacy were evident across the framework (Figure 2.3). However, few documents examined supermarket instrumental power achieved by participation in PPP activity. The Australian government has worked with supermarkets on PPP food and nutrition initiatives since 2009, including the Food and Health Dialogue [294], and the more recent Healthy Food Partnership [295]. There has been limited Australian government action on national nutrition policy since 2010, with the Healthy Food Partnership comprising one of only two national policy actions (the other being voluntary front-of-pack labelling) [299]. The Healthy Food Partnership aims to improve the nutrition of all Australians by encouraging healthy eating, and comprises representatives from public health, government, a peak body representing the interests of food manufacturers, the two supermarkets Coles and Woolworths, and wholesaler Metcash [295]. The extent of supermarket power is demonstrated though this membership whereby the supermarkets and wholesaler are individually represented but transnational food manufacturers are represented by one peak body. Given the power supermarkets hold within the Australian food system, and limited government national nutrition policy action, it is important that their influence over PPP initiatives that potentially impact the health of all Australians is transparent, and aligned with public health priorities, and this deserves more attention from researchers. If managed appropriately, participation from supermarkets holds great potential to improve the food supply.

The scoping review documents discussed Australian supermarket power obtained by private standards including CSR activity. Supermarkets have initiated CSR to demonstrate commitments to reducing food waste [123], and animal welfare [43], as well as support government-led initiatives such as the Healthy Food Partnership [295]. The current study found very little published information about the extent and nature of Australian supermarkets' CSR commitments, or how CSR is utilised as a source of power. There have been few public health evaluations of Australian food industry CSR activity, and none focusing specifically on supermarkets to date [55, 146, 300]. There is evidence from other countries of work being undertaken by supermarket chains to

assist their customers to select healthy foods. For example, a supermarket-wide shelf-edge labelling system that identifies healthy foods has been adopted by five chains in the US [301] to overcome consumers' inability to make sense of packaging information [302]. US grocer Daily Table has been described as the first not-for-profit store that aims to provide nutritious and affordable meals for low-income families [303]. In the UK, Tesco and Sainsbury have improved the nutrient profile of supermarket own brand foods, removed confectionery and sugar-sweetened beverages from checkouts [48, 49], and banned multi-buy promotions that encourage large purchases of sugar sweetened beverages, biscuits, confectionery, and potato chips [304]. Loblaws in Canada has introduced personalised shopper profiles that track the healthiness of foods purchased [305].

Global assessments of the food industry's CSR impact on public health, such as the Access to Nutrition Index [160], which aims to encourage private sector companies to increase access to healthy products and to responsibly exercise their influence on consumers' food choice and behaviour, do not include supermarkets within their scope, despite the massive growth of own brands globally [29]. Based on the findings of this current study, and assuming that supermarkets have similar power in other developed countries, a similar survey of the largest global supermarkets is recommended to increase transparency regarding the size and scale of their actions. Research that examines Australian supermarket CSR as a source of power, and the impact on public health is also needed.

Aspects of discursive power that have been attributed to the Australian food industry include framing the debate regarding personal responsibility for being active; and stating the food industry provides safe foods, and promotes healthy lifestyles [146]. However, these practices were not evident for supermarkets in this scoping review. In addition, none of the documents referred to supermarkets framing issues around the government acting as a 'nanny state' to protect public health, or criticising public health advocates, which previous research identified as tactics used by the Australian food industry [146]. This suggests that either supermarket discursive power is obtained and used in different ways to other actors in the food system, or there is a gap in the literature, which warrants further examination. The complex relationships between supermarkets, transnational food manufacturers, and industry associations, and their

influence over public policy have not been explored and deserve more attention in future research.

2.4.5.6 Implications of supermarket power for public health

In addition to synthesising the sources of Australian supermarkets' power, this scoping review examined the documents for descriptions of the implications for public health. These findings are mapped in a framework of the public health implications of supermarket power (Figure 2.6). Few positive public health impacts of supermarket power were identified, providing many opportunities for improvement in the domains of food governance, the food system, and public health nutrition.

2.4.5.7 Implications for food governance

Supermarkets act as guardians of public health due to their power within the food system [282]. Through association with food and health experts they have established reputations as authorities in these areas [262, 280, 282]. Supermarkets sell tobacco in stores, and operate licenced premises that sell and promote alcohol and gaming, thus impacting negatively on public health beyond food and non-alcoholic beverage retailing [279]. They influence national food and nutrition policy and population dietary intake through their participation in Australian government PPPs, such as the Food and Health Dialogue [294] and the Healthy Food Partnership [295]. They also act as gatekeepers of food standards [24, 251] and the food supply [266, 296]. The one positive food governance impact identified was supermarkets manage the food system effectively to deliver cheap and safe food, with minimal government regulation [249]. This positive finding is of enormous benefit to consumers.

2.4.5.8 Implications for the food system

The power of supermarkets has challenged the viability of small retailers [235, 270]. Supermarkets tend to favour bigger producers and large transnational food manufacturers over small producers [273], whose viability is also uncertain [235, 281]. Small producers have become larger to meet the increasing costs of doing business with supermarkets, or have left the market [42]. Due to advances in technology and digital information, supermarkets have introduced a just-in-time way of operating that has driven workforce changes throughout the food system, including casualisation and work intensification [273]. Supermarkets have entrenched an industrial food system that

is invisible to consumers [43, 263]. Ultimately, lower prices for consumers come at the expense of Australian producers [296]. Until recently, all suppliers had to bear the cost of compliance with multiple supermarket private standards [42]. (Australian supermarkets have collaborated with primary producer group Horticulture Australia to create a Harmonised Australian Retailer Produce Scheme (HARPS), which was introduced at the beginning of 2017 [306].) The cost of competing with supermarket own brands impacts on investment by branded manufacturers into product innovation [143, 247], and their financial viability [289, 296]. Supermarket own brands also impact on competition within the market [289], placing pressure on wholesale prices [143], which can be positive or negative for consumers. Consumer discontent with supermarket power has been a factor driving growth in alternative food networks such as farmers markets [235]. No positive food system impacts were identified.

2.4.5.9 Implications for public health nutrition

Food safety and quality

Through implementing private quality standards supermarkets have had positive effects on food safety and quality [23, 25, 41, 43, 57, 124, 247, 253-255, 257, 270, 281, 282], resulting in a safe food supply [41, 57, 235, 249, 258, 264]. However, supermarkets now use private standards to exert control over aspects of food production that extends beyond food safety, including cosmetic appearance of fresh produce, and social and environmental considerations such as fair trade standards [12, 23, 42, 43, 251, 256, 258, 259, 262-265, 269, 281, 282].

Nutritional quality

Supermarkets impact negatively on public health nutrition by selling products with poor nutritional quality [253, 287] and encouraging consumption of these foods [12, 124, 282]. They promote consumption of unhealthy foods via pricing, placement and promotional strategies [282]. Interventions to restrict availability of these unhealthy foods have been proposed as a measure to increase healthy eating [11]. Supermarkets can also positively affect population dietary intake by making fresh, healthy foods more available, affordable, and accessible [12]. Supermarkets have control over own brand products, and can determine the choice of ingredients and nutritional content [24] (see **Error! Reference source not found.**). This presents an opportunity for public health

professionals to work with supermarkets to improve the nutritional quality of the food supply [11].

Food cost and affordability

Supermarkets determine food prices, which is an important strategic decision for the chains [12]. The focus of supermarkets on price, which has been promoted as consumer-driven, has resulted in an average drop in food prices [291, 292]. Supermarkets influence population dietary intake by the prices they charge [282], and reducing prices for healthier products was identified by public health researchers as a promising strategy to improve supermarket food environments [11]. However, supermarkets' emphasis on providing cheap food [261] and their drive to compete based on low prices has led to compromises over animal welfare standards [259]. The affordable low prices of supermarket own brands drives branded food producers to compete on price, and some cheapen the quality of ingredients to do this [267].

Accessibility

Supermarkets determine the location of stores [12], and their presence generally makes a positive impact on population diets by increasing the proportion that can access affordable foods [282]. Supermarkets also decide how much space is allocated for each product [12], and where food items are placed within stores [11], or located on shelves [273]. Supermarkets have allocated own brands premium eye-level shelf positions [279]. Supermarkets also make decisions about what foods will be placed in prominent locations such as ends-of-aisles or checkouts [11, 287].

Food preferences and choices

Supermarkets state they supply the products that their customers want, but the reality is that they shape the food choices and preferences of consumers [287]. They influence food choice by predetermining what products are available [254], and shaping norms and values around foods that meets modern lifestyle needs [252]. Supermarkets have been the main driver of the requirement for standardised, cheaply produced foods [24], which may diminish local food cultures [241]. They also affect food choice by developing own brand products [24]. Growth of supermarket own brands and a strategy of selling only one or two branded alternatives limits consumers' food choice, which could be

detrimental if products are lower quality [266]. Overall, supermarkets shape the food environment in which consumers select foods [12] with no positive impacts identified.

Sustainability

Supermarket quality standards and CSR do not adequately address sustainability, and all impacts identified were negative. For example, supermarket zero waste initiatives simply push the problem onto other actors without addressing waste throughout the whole food system [123]. Similarly supermarkets' flexible supply arrangements with fresh produce growers, who have to plan for the maximum order quantity, create high wastage when the produce is not required [123]. Supermarkets' focus on cosmetic appearance along with other food quality attributes also contributes to food waste, and has led to a loss in species diversity [263]. Supermarkets have shifted the public debate away from establishing acceptable animal welfare standards, to letting consumers choose based on product labelling [262].

Availability

Supermarkets determine what food is available in stores, which influences what food is produced [12]. They appear to offer consumers choice, but don't provide the information needed to inform those choices [261]. For example, supermarket quality standards enforced with suppliers are typically not communicated to consumers [281]. They also provide very little information about animal welfare standards [261]. Supermarkets aim to meet consumer demand for ready prepared foods, and own brands have driven product innovation in ready-to-eat convenience foods, and ethically sourced foods [43, 247].

2.4.5.10 Strengths and limitations

Strengths of this study include the synthesis of evidence from many sources, including grey and peer-reviewed literature, spanning many disciplines. The search strategy identified diverse documents that reported sources of supermarket power. These documents were also examined using a public health lens to understand the implications of supermarket power. This Australian study is the first of its kind examining the implications of supermarket power, and could indicate similar situations in other developed countries. Limitations include the possibility that the search strategy did not capture all relevant documents, and that the current study has therefore

overlooked some aspects of supermarket power or public health implications. Given the focus of this review on identifying gaps in knowledge to make recommendations for further research, future action to hold supermarkets to account by government, consumers, or other food system actors are not discussed. Consistent with the scoping review protocol adopted, the quality of included documents was not assessed.

2.4.6 Conclusions

This scoping review revealed that supermarkets hold a powerful position in the Australian food system, acting as the primary gatekeepers. Supermarkets have obtained instrumental, structural, and discursive power from many sources which overlap and reinforce each other. Main sources were high market concentration, the ability to set the terms of trade for suppliers, governance of the food system via private quality standards, development of supermarket own brands, and framing issues around the identities of food system actors and societal norms. Political legitimacy of supermarket power has been achieved through their authority status, and government and consumers have failed to challenge their unelected leadership of the food system. A number of gaps in the literature have been identified, including lack of examination of supermarkets' influence over PPP initiatives that potentially impacts the health of all Australians; supermarket CSR as a source of power, and the potential impact on public health outcomes including obesity; and whether their power allows supermarkets to influence public health in different ways to other food system actors. There is very little public health research examining the impact of supermarket power in Australia, which is surprising given the dominance of only two major supermarket chains.

Supermarket power impacts food governance, by influencing policy and setting private rules; the food system, by influencing livelihoods and the sustainability of communities; and public health nutrition, by influencing the availability, affordability, accessibility, and sustainability of healthy foods in Australia. Although an enormous benefit of supermarket power has been provision of cheap, safe food there were few positive impacts identified overall, providing many opportunities for improvement. To create food environments supportive of healthy choices and improved health outcomes (i.e. reduce obesity, non-communicable diseases, and their inequalities) it is important for the power of supermarkets to be transparent, and for them to be held

accountable for their impacts on public health. In particular, further research to examine supermarket own brands is needed, due to their pivotal role as a source of supermarket power and their potential to improve public health.

2.4.7 Footnote

Findings from the scoping review that identify the pivotal role supermarket own brands play as a source of supermarket power and impact on public health are summarised in the following tables (Table 2.10 and Table 2.11). The tables were included as supplementary information in the publication, and provide a critical justification for the focus of this thesis on supermarket own brand foods.

Table 2.10 Summary of information that describes supermarket own brands as a source of supermarket power in Australia

1. Supermarket own brands are a source of instrumental power	
Public-private-partnerships	• Supermarket own brands from Coles, Woolworths and Aldi were involved in all food categories included in the Food and health dialogue which aimed to reformulate commonly consumed products [294].
Access to knowledge	• Supermarkets become de facto manufacturers when developing own brands, and have access to consumer information via shopper data, which is not available to suppliers [282]. • By developing own brands, supermarkets gain access to information about competitors [270]. • Supermarkets gain access to information about manufacturing costs by developing own brand products. This information can be used to screen cost price requests made by branded manufacturers [239].
2. Supermarket own brands are a source of structural power	
Relationship with suppliers of branded products	• Development of supermarket own brands has led to a shift in power relations between supermarkets and manufacturers [273, 274]. • By developing own brands, supermarkets are not only buyers, but competitors to their suppliers. The dual role of supermarkets as customer and direct competitor means there is a risk that abusive practices may be imposed on branded manufacturers [23]. • Supermarkets value own brands because they increase their leverage in negotiations with manufacturers of branded products [11, 239]. • Supermarket own brands are extremely unpopular amongst many branded suppliers, who face loss of brand status, reduced profit margins, or reduced shelf space [296]. • Suppliers believe that supermarket own brands are a threat, and add to the power of supermarkets by allowing them to demand more from suppliers and remove branded products [25]. • As supermarkets' negotiating leverage against branded suppliers increases, dependence on any individual branded product is reduced which gives the supermarket greater flexibility to reduce branded products' shelf space or stock a more limited range, and increases the credibility of supermarket threats to delist branded products [239]. • Given that shelf space is finite, branded goods are inevitably being removed to make space for supermarket own brands [23]. • Supermarkets own brand products are allocated more prominent shelf space than branded products, and suppliers have to compete directly with their retail outlet for space [289]. • Development of own brands allows supermarkets to translate instrumental power to set terms of trade for suppliers, into structural power to set and enforce private standards, and effecively become regulators of the food system [43]. • Supermarket power allows them to manoeuvre suppliers into supporting own brands [289].
Competition with other food retailers	• Aldi's market entry in 2001 fundamentally altered the role of supermarket own brands [274]; there was a significant increase in direct response [277]. • The advantages of own brands to supermarkets include potentially improved consumer loyalty which offsets own brand competition from other chains [277].

Consumer loyalty	• Supermarket own brands form a strategy to develop consumer trust and loyalty [11, 282, 289]. • Supermarket own brands strengthen their reputation for quality products at low prices with consumers [246, 284]. • Supermarket own brands place pressure on food processors that directly benefits consumers by lowering prices and effectively raising household disposable income [278]. • The advantages of own brands to supermarkets include more control over product design and marketing, and potentially improved consumer loyalty [277]. • Over 80% of shoppers buy supermarket own brand products [274].
Market competition	• Development of supermarket own brands leads to a more fragmented and competitive market environment, and provides an additional obstacle for food manufacturers to gain market access [279]. • Growth of supermarket own brands has the potential to distort competition because supermarkets may promote their own brands in preference to branded products, or retain additional promotional benefits obtained by suppliers of branded products instead of passing them onto consumers [274]. • Supermarket own brands can reduce double marginalisation (i.e. both the manufacturer and the retailer adding a profit margin) meaning consumers will pay less provided they are happy to buy the own brand product [266]. • New food companies have emerged, who only manufacture own brand products [247].
Market share	• Supermarkets developed their own brands to increase market share [23]. • Supermarket own brand products account for 25% of supermarket sales [143]. • Supermarkets own brands are now available across all product segments from basic household goods to high-end and organic product ranges [124]. • The extent of supermarket own brand share of sales varies by category, influenced by the relative strength of branded products and the nature of product differentiation that exists within categories [143]. • Woolworths report that 15% of their sales are from supermarket own brands, compared to 20% for Walmart, 50% for Sainsbury's and 90% for Aldi [291]. • Globally, market share of supermarket own brands is increasing, and are predicted to continue to grow until they dominate the food supply led by the largest supermarket chains [57].
Market domination	• Development of supermarket own brands contributes to the process of domination by supermarkets, called 'supermarketisation' [235]. • One of the most important consequences of supermarket domination of the food system is growth in supermarket own brand products, which allow supermarkets to exert greater control over their supply chains, and get greater returns [282]. • By 2020-21, it is unlikely there will be a branded product range completely safe from own brand competition [124].
Financial benefits to supermarkets	• Supermarket own brands contribute to the profitability of supermarkets at the expense of second-tier brands [11]. • Sales of Coles supermarket own brand products account for 25% of the supermarket's revenue, and deliver higher margins for the company [284]. • Profit margins on own brand products are higher than for branded products [23, 246, 249, 289], estimated at about 2% higher [277].

Risk manangement	• Supermarket own brand private standards help to reduce risk for the supermarket by imposing rigid conditions for products, processes, and movement through the supply chain [264].
Vertical integration	• Development of supermarket own brands has led to vertical integration of supermarkets into manufacture [239]. • Coles initiated the development of supermarket own brands that led to vertical integration of retailing and distribution with manufacturing [288]. • By entering long-term contracts for own brand milk with processors supermarkets have increased vertical integration [288]. • Growth in supermarket own brands has the potential to decrease the competitiveness within vertical supply chains [274].
International sourcing	• Supermarket own brands can be sourced globally so there is less dependence on local suppliers [24, 279]. • They enable flexible product sourcing from anywhere in the world [249], particularly for processed foods [143]. • Woolworths report that, by sales, 74% of own brand products are made in Australia including: 95% of Macro, 67% of Select, and 72% of Homebrand (2014) [291].
3. Supermarket own brands are a source of discursive power	
Framing actor identities	• A report prepared for Coles states that a common perception of supermarket own brands is that they are detrimental to supplier welfare because they allow supermarkets to consolidate market power and monopolise the entire supply chain. However, Coles does not produce the product but instead relies on food manufacturers [292]. • The report prepared for Coles also states that shelving preference is a contentious issue, whereby supermarkets are accused of deliberately locating supermarket own brand products in more visible locations, so that consumers are more likely to choose own brands. Coles' data on ranging and space allocation shows that own brand products are treated the same as branded products, based on consumer demand [292]. • Although private standards for supermarket own brands are not communicated to consumers, including via packaging, supermarkets communicate through their own brand products to create a loyal and stable customer base [281]. • Coles stated that they make product decisions based on sophisticated customer preference modelling and volume of sales; there is no strategy to replace branded products with own brand [278].

Table 2.11 Summary of information that describes the impact of supermarket own brands on public health

1. Impact of supermarket own brands on food governance	
Set private standards without participation from other actors	• It is recommended that governments and civil society call for regulation of animal welfare, food production, and labelling rather than leaving it to supermarkets via their own brand products [43].
Impact on public health via sales of alcohol	• Woolworths has reported strong growth in own brand alcohol sales, with the launch of multiple lines of own brand products including alcoholic ginger beer, flavoured ciders and premium bourbon [285].
2. Impact of supermarket own brands on the food system	
Affect viability of small producers	• Development of supermarket own brand products causes smaller producers and local food networks concern, because the products are cheaper, and they enhance the market power of the supermarket [241].
Affect viability of small retailers	• Supermarkets can use their combined market power to secure market dominance and destroy more of their smaller independent retail competitors [288]. • Independent retailers find it hard to compete with chain supermarkets on price due to the efficiencies gained by vertical integration in the development of supermarket own brands [270].
Impact on competition, branded manufacturer viability	• Supermarket own brands provide an additional obstacle to be overcome by branded manufacturers to gain market access [279]. • Suppliers have argued that the major supermarkets give preference to their own brand products through pricing and other marketing strategies[267], which has the potential to distort competition [274]. • Suppliers claim that the development, promotion, and discounting of supermarket own brand products has come at their expense because supermarkets give preference to own brand products [267]. • Growth of supermarket own brands puts pressure on suppliers to compete for space or become own brand suppliers, which will cannabilise their market and put them in the position of competing with their buyer [25]. • Development of supermarket own brands is the main driver for major restructuring in the agrifood sector [246]. • However, it has also been reported that supermarket own brands increase competitive pressures in the market [292]. • Some branded manufacturers bid for supermarket own brand business to build stronger relationships with the supermarkets and therefore improve their bargaining position for branded products [289].
Impact on manufacturer innovation	• Supermarket own brands do not have to invest in building a brand, securing shelf space, or advertising, or spend as much on product development, as that has already done by the brand manufacturer [247, 278]. • The pressure placed by supermarket own brands on prices means they potentially impact on investment by branded manufacturers into new product innovation [143], by weakening the incentive for investment [289]. • When branded manufacturers are financially affected by the presence of supermaket own brands, due to reduced returns or costs to access shelf space, investment in innovation may be reduced [270]. • The Australian Food and Grocery Council has claimed that branded products need to turn over 50% more stock than supermarket own brands to be more lucrative to the supermarket [278].

Impact on manufacturer innovation (continued)	• Use of copycat packaging by supermarket own brand products is one of the factors leading to a lower rate of product innovation by manufacturers [23].
Impact on specific food categories	• Supermarket own brands account for 80% of egg sales making egg producers highly dependent on supermarkets [25]. • Expansion of supermarket own brand products into the categories of cheese, dairy spreads, eggs, bread, flour, dry groceries placed pressure on wholesale returns, branded products, and performance of marketing and product innovation of manufacturers [143].
3. Impact of supermarket own brands on public health nutrition	
Food safety and quality	• As supermarket own brand products have increased in availability, their quality has become increasingly important [43]. • When branded manufacturers are financially affected by the presence of supermaket own brands, investment in innovation may be reduced, and this could affect product quality and variety [246, 270]. • Supermarket private standards for own brand foods can have positive effects on food safety and some aspects of food quality [281].
Nutritional quality	• Supermarkets influence population health via own brand products. They determine the ingredients used and contribution of added fats, sugars, and salt [24]. • Public health researchers have identified an opportunity to work with supermarkets to improve food selection, for example by creating own brand food products that are lower in calories, fat, and added sugars [11]. • Supermarkets make commitments to health and wellbeing via CSR reporting, including for own brand products [254]. • CSR strategies led by supermarkets regarding health and wellbeing include product reformulation, and introduction of supermarket own brand healthy ranges [12, 43, 282]. • Supermarket chains participated in the government-led Food and Health Dialogue to reformulate commonly consumed own brand products to reduce sodium [294]. • Development of supermarket own brands will affect consumers if suppliers de-value their products to compete [267].
Food cost and affordability	• Supermarkets tend to use everyday low pricing practices to improve competitiveness of own brand products [143, 246]. • Development of supermarket own brand products initally had a positive impact on food security, as many products became cheaper [241, 254]. • Good quality supermarket own brands that compete with top-selling branded products attract price-conscious consumers away from second-tier brands [11]. • Supermarket own brands offer consumers more affordable options, and place pressure on prices of branded foods [278], which has led to lower prices overall [12]. • Coles has become particularly competitive through its large range of cheap own brand products [284]. • The increased range of more affordable supermarket own brand products has enabled consumers to maintain spending on discretionary items without paying more overall [124]. • Manufacturing supermarket own brands in addition to branded products can help suppliers to become more efficient and achieve economies of scale, thus reducing costs of production [239].

Food cost and affordability (continued)	• Supermarkets can access information about the costs of own brand products to screen cost price requests made by branded manufacturers, to ensure price competitiveness [239].
Accessibility	• Supermarkets typically make a positive contribution to food security by increasing accessibility to affordable foods, including via supermarket own brands [282]. • Supermarket own brands are typically allocated premium eye-level shelf positions [279]. • A report prepared for Coles reports that shelving preference is a contentious issue, whereby supermarkets are accused of deliberately locating supermarket own brand products in more visible locations, so that consumers are more likely to choose own brands. Coles' data on ranging and space allocation shows that own brand products are treated the same as branded products, based on consumer demand [292].
Food preferences and choices	• Supermarket own brands offer consumers alternative, more affordable options, and choice [274, 278]. • Woolworths said they develop own brands to increase choice for consumers, who say they love the value and quality offered by own brands [278]. • A greater range of supermarket own brand products, which are often cheaper than branded products, has enabled consumers to buy gourmet and discretionary items [124]. • Development of supermarket own brand products initally had a positive impact on choice, allowing more people to meet food preferences for organic, fair trade, kosher, halal, and vegetarian foods [254]. • If supermarket chains implement their preferred strategy of stocking supermarket own brand products and only one or two branded products, consumers may experience lack of choice [266].
Sustainability	• Supermarket own brands have been used to develop organic, environmentally sustainable, healthy, fairly traded, and humanely raised [43]. • Coles have implemented private standards for own brand free range eggs and based on their market power this is likely to become a new industry standard [287]. • The supermarket chains have responded to some customers' concerns about the consequences of industrial food production by introducing RSPCA-approved chicken, sow-stall-free pork, and hormone-free beef for their own brand meat range [263]. • Coles announced that all its own brand chicken would be RSPCA approved, accompanied by an ad campaign featuring Curtis Stone. The Coles animal welfare conditions exceeded legal requirements but was positioned to consumers as better tasting chicken, with improved animal welfare as the means for achieving this rather than an independent virtue which consumers should desire for chicken [259].
Availability	• Supermarket own brands have moved beyond imitation and now aim to meet consumer demands for convenience and ready prepared foods [247]. • Supermarket own brands no longer just compete with brands but dominate new product launches [247]. • Supermarket own brands have been used to develop innovative value-added products such as gourmet prepared meals [43].

2.5 Summary of the chapter

This chapter presented an overview and critique of the literature relevant to the research topic. The Australian peer-reviewed literature that has examined consumer nutrition environments was summarised, gaps in knowledge were identified, and recommendations for future research priorities were made. The sources of Australian supermarket power were mapped using a framework of the dimensions of supermarket power and influence. Evidence of how supermarkets impact public health were also mapped to the domains of food governance, the food system and public health nutrition. The context of globalisation of the food system, and the neoliberal political agenda which has minimised the policy role of the state were described. Australian supermarkets have assumed a food governance role, whereby they set private standards for growers, farmers, and food manufacturers to meet in order to achieve supplier status. They have also implemented CSR to address consumer concerns and minimise their societal impact. Little is known about Australian supermarket CSR commitments that impact public health, or the contribution of supermarket own brand foods to consumer nutrition environments.

Chapter 3 METHODOLOGY

This chapter includes a published manuscript:

Pulker CE, Trapp GSA, Foulkes-Taylor F, Scott JA, Pollard CM. The extent and nature of supermarket own brand foods in Australia: study protocol for describing the contribution of selected products to the healthfulness of food environments. *Nutr J.* 2018; 17: 95. (*Nutrition Journal has an impact factor of 3.568.)*

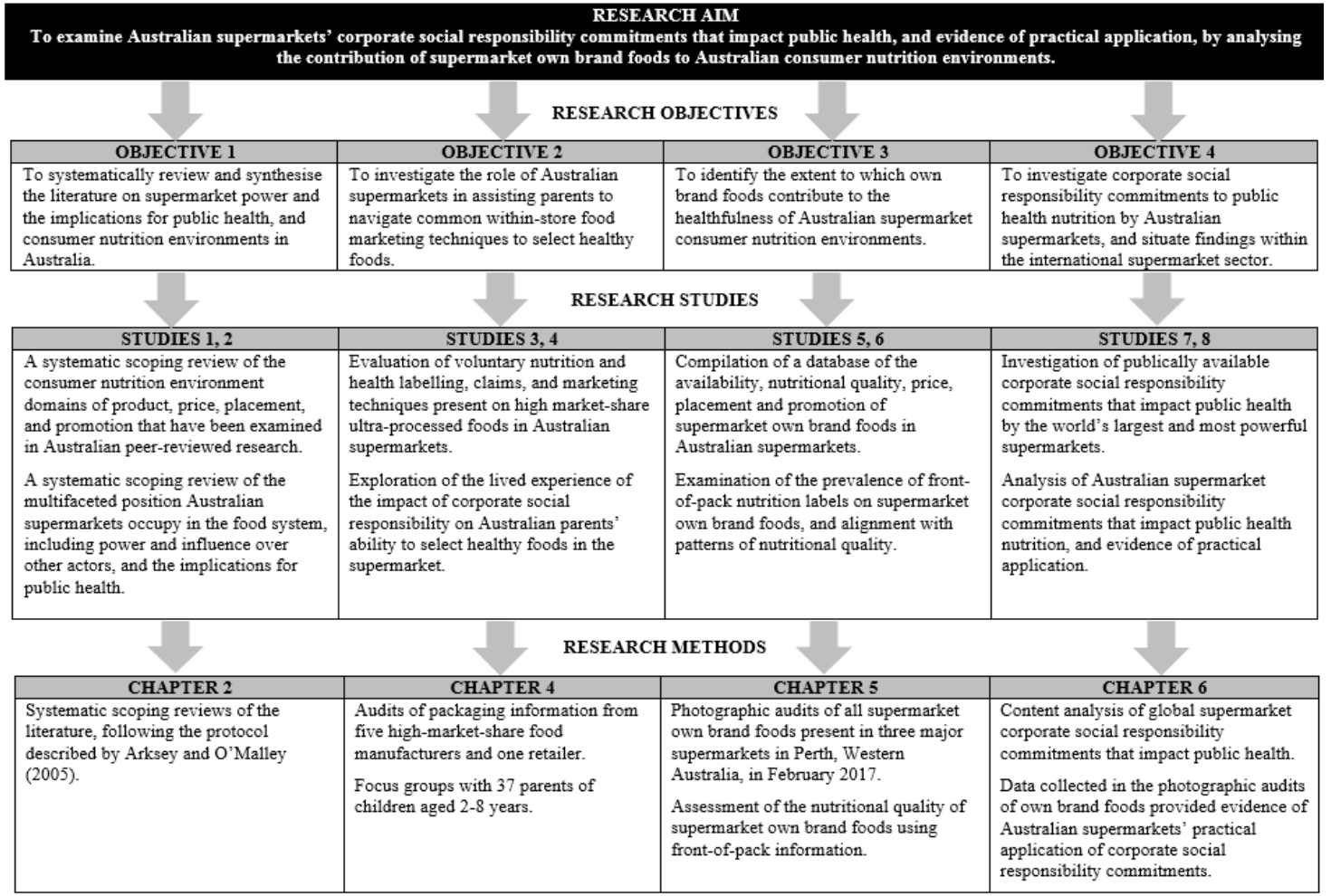
3.1 Overview of the chapter

This chapter summarises the research methodology used to meet the following four research objectives: (1) To systematically review and synthesise the literature on supermarket power and the implications for public health, and consumer nutrition environments in Australia; (2) To investigate the role of Australian supermarkets in assisting parents to navigate common within-store food marketing techniques to select healthy foods; (3) To identify the extent to which own brand foods contribute to the healthfulness of Australian supermarket consumer nutrition environments; and (4) To investigate CSR commitments that impact public health nutrition by Australian supermarkets, and situate findings within the international supermarket sector.

A multistage mixed-methods approach [307] was adopted, to gain breadth and depth of the research topic [308]. This approach uses multiple stages of data collection and analysis that includes combinations of approaches [307]. This research employed an *exploratory sequential* design whereby the qualitative systematic scoping reviews in studies 1 and 2 informed subsequent quantitative data collection in study 5. It also included a *convergent* design for studies 3 and 4 whereby the qualitative and quantitative data were collected and analysed at a similar time. An *exploratory sequential* design was also used for study 8, when applying qualitative findings to inform the quantitative analysis of the supermarket audit data. One of the advantages of using mixed-methods is the opportunity to integrate qualitative and quantitative findings, including using the results from one type of study to inform the design or analysis of another [309]. The research findings will be reported in a staged way for each study in turn, and then integrated in chapter 7.

A brief overview of the methods used for studies 1-8 will be provided, because the detailed methods are contained within the relevant chapters (Figure 3.1). The detailed methods for conducting the supermarket audits (studies 5, 6 and 7) are provided in this chapter. The published study protocol describes the methods developed to examine the availability, nutritional quality, price, placement and promotion of supermarket own brand foods within Australian supermarkets.

Figure 3.1 Overview of the research methods used to address each of the objectives



3.2 Systematic scoping reviews: Studies 1 and 2

In order to summarise and critically analyse the literature that describes what is known about consumer nutrition environments which includes supermarkets, and supermarket power and the implications for public health, two systematic scoping reviews of studies relevant to Australia were conducted.

Systematic scoping reviews have been defined as the process of mapping the existing literature, and are useful to identify key concepts, theories, and sources of evidence [180]. They can seek to summarise and disseminate research findings, and identify research gaps in the existing literature [180]; explore the extent of the literature without reporting the findings in detail, or define parameters and potential scopes of a systematic review [245]. The scoping review methodology recommends presenting the extent, nature and distribution of the studies included, so that an overview of the material is provided, but the quality of included documents is not assessed. The five steps to conducting a systematic scoping review are: (1) define the research question; (2) identify relevant studies; (3) select studies to include; (4) chart the data, whereby data are extracted and synthesized; and (5) summarise and report the results [180].

Scoping review methodology specifies charting or mapping the data which involves extracting relevant information to provide a summary of results that meet the research objective [181]. Document analysis was employed for the data extraction stage in studies 1 and 2. The document analysis process used required skimming each of the documents, then reading more thoroughly, followed by extracting the data into predetermined categories or themes that related to the research objectives [310]. The process involved triangulating multiple sources of evidence, often from different types of sources [310].

The first scoping review aimed to summarise peer-reviewed Australian studies that have examined consumer nutrition environments; identify knowledge gaps; and provide recommendations for future research. A systematic search was conducted to identify literature that investigated Australian consumer nutrition environments, which includes the domains of product, price, placement and promotion. As this is an emerging field of research in Australia, the review summarised which domains of the consumer nutrition environment have been examined and the approaches used, rather

than what was found. Data identified in the studies that related to the four domains were further classified into the subdomains identified by Glanz *et al.* [11]: product availability and quality, product assortment, design of products and packaging, nutritional quality, provision of supermarket own brand products, pricing strategy, price sensitivity and elasticity, price promotions, in-store location, shelf location, and other promotions. Comprehensive details of the study methodology are provided in Chapter 2.

The second scoping review aimed to synthesise the literature that describes the position that supermarkets occupy in the Australian food system, including their power and influence over other actors; identify gaps in knowledge; make recommendations for further research; and identify the implications for public health. A systematic search was conducted to identify peer-reviewed and grey literature that described the sources of supermarket power, and analysis of the selected documents was conducted to identify the implications of supermarket power for public health. A framework of the dimensions of supermarket power and influence, adapted from the work of Clapp and Fuchs [47] and Mialon *et al.* [60] was constructed, and reference to any aspect was recorded for each document. Evidence for how supermarket power impacts food governance, the food system and public health nutrition was also recorded. Comprehensive details of the study methodology are provided in Chapter 2.

3.3 Audits of packaging information: Study 3

In order to set the scene for the main body of research, common within-store marketing techniques were explored. This was done by conducting audits of packaging information present on highly processed foods, known as ultra-processed foods [67], as well as focus groups with parents of young children which is described in the next section. The audits of packaging information were conducted to meet the aim of objectively evaluating voluntary nutrition and health labelling, claims and marketing techniques on high-market share ultra-processed food, for their potential impact on public health.

Five high-market-share food manufacturers (Allen's, Kellogg's, Nestle, Sanitarium, Uncle Toby's) and one supermarket own brand (Woolworth's Macro brand) were identified using information from a market report [311]. Data from the labels of 230

packaged foods, including foods commonly marketed to children [312], were collected from supermarket and manufacturer websites. A taxonomy of nutrition- and health-related packaging information was used to classify the data. The taxonomy was based on the INFORMAS food labelling taxonomy [313], Mayhew *et al.*'s definitions of marketing techniques that promote health and wellbeing [314], and Mehta *et al.*'s work defining packaging that targets children [86]. Legal compliance of the nutrition and health related packaging information was assessed using the Australian Food Code, which sets out criteria that are required to be met to make health and nutrition claims [110, 315, 316]. Further details of the study methodology are provided in Chapter 4.

3.4 Focus groups: Study 4

Parents' ability to navigate common within-store marketing techniques to select healthy foods was explored in focus group research. Although consumers may not be aware of CSR initiatives, they select food in supermarket environments which are impacted by food companies' voluntary efforts to act responsibly. The study aimed to describe the lived experience of CSR on parents' ability to select healthy foods in the supermarket. The exploratory nature of the research guided selection of the most appropriate method. Qualitative methods allow open-ended in-depth inquiry into a specified topic [317]. Focus groups were chosen to allow participants to talk to each other as well as the facilitator, which is a useful way of exploring knowledge and experience [318].

Five 90-minute focus groups were conducted by an experienced market research facilitator in Perth, Western Australia. Purposive sampling was used to recruit participants from both high and low socio-economic status areas [319]. Thirty-seven parents of children aged between 2 and 8 years participated: four fathers and 33 mothers aged 25 to 48 years. Use of visual stimuli to encourage discussion between focus group participants has been shown to be effective [320]. Therefore, 25 packaged foods selected from high-market share food manufacturers and a retailer were introduced to stimulate discussion. The same food companies were used in studies 3 and 4, although not the same products. The products for the focus groups were chosen to show a variety of marketing techniques commonly used by manufacturers to appeal to children, including cartoon characters, playful shapes, bright colours and health statements and claims. Some products featured the Health Star Rating front-of-pack

nutrition label with a range of scores. Groups were audio-recorded and transcribed verbatim and inductive thematic content analysis was conducted [321]. The implications for CSR were analysed using *political* (i.e. large companies accept responsibility for their impact on society via corporate citizenship) and *ethical* (i.e. companies accept social responsibilities as an ethical obligation) lenses [59].

3.5 Publication #3: The extent and nature of supermarket own brand foods in Australia: study protocol for describing the contribution of selected products to the healthfulness of food environments [1] (Studies 5, 6, and 8)

3.5.1 Abstract

Background: While public health experts have identified food environments as a driver of poor diet, they also hold great potential to reduce obesity, non-communicable diseases, and their inequalities. Supermarkets are the dominant retail food environment in many developed countries including Australia. The contribution of supermarket own brands to the healthfulness of retail food environments has not yet been explored. The aim of this protocol is to describe the methods developed to examine the availability, nutritional quality, price, placement and promotion of supermarket own brand foods within Australian supermarkets.

Methods: Photographic audits of all supermarket own brand foods present in three major food retail outlets were conducted. Two researchers conducted the supermarket audits in Perth, Western Australia in February 2017. Photographs showing the location of the in-store product display, location of products on shelves, use of display materials, and front-of-pack and shelf-edge labels were taken for each supermarket own brand food present. An electronic filing system was established for photographs from each of the supermarkets and an Excel database constructed. The following data were extracted from the photographs: front-of-pack product information (e.g. product and brand name, pack weight); packaging and label design attributes (e.g. country of origin; marketing techniques conveying value for money and convenience); shelf-edge label price and promotion information; placement and prominence of each product; and nutrition and health information (including supplementary nutrition information, nutrition and health claims, and marketing statements and claims). Nutritional quality of each product was assessed using the principles of the Australian

[1] This is the accepted version of the following article: Pulker CE, Trapp GSA, Foulkes-Taylor F, Scott JA, Pollard CM. The extent and nature of supermarket own brand foods in Australia: study protocol for describing the contribution of selected products to the healthfulness of food environments. *Nutr J*. 2018; 17: 95, which has been published in final form at https://doi.org/10.1186/s12937-018-0404-4.

Guide to Healthy Eating, the NOVA classification of level of food processing, and the Health Star Rating score displayed on the front-of-pack.

Discussion: Approximately 20,000 photographic images were collected for 3940 supermarket own brand foods present in this audit: 1812 in the Woolworths store, 1731 in the Coles store, and 397 in the IGA store. Analysis of findings will enable researchers to identify opportunities for interventions to improve the contribution of supermarket own brands to healthful retail food environments. This protocol is unique as it aims to investigate all aspects of retail food environments and address the contribution of supermarket own brands.

3.5.2 Background

Poor diet is one of the most important risk factors for early deaths globally [2]. While public health experts have identified food environments as a driver of poor diet [7-9], they also hold great potential to reduce obesity, non-communicable diseases, and their inequalities [66]. Food environments which can influence eating behaviour include the number, type, location, and accessibility of food outlets present in a community; and the within-store characteristics that can influence food selection [10] including the marketing mix of product, price, placement, and promotion, as well as provision of nutrition information [11]. The term 'retail food environment' is also used when referring to supermarkets and other food retail outlets [66].

In Australia, supermarkets are the dominant retail food environment (63% of total food expenditure in 2012-13) [21], and the sector is highly concentrated with the two largest chains accounting for 70% of grocery sales [124]. This is one of the highest levels of supermarket concentration globally [23]. Concentration of grocery sales has taken place in other developed countries [236] including Austria, Canada, Denmark, Germany, France, Spain, and the United Kingdom (UK) [23]. Australian supermarkets hold a powerful position as primary gatekeepers of the food system [322]. They impact public health nutrition by influencing availability, affordability, accessibility, and sustainability of healthy foods [322]. Supermarkets decide the product assortment available, price, promotions, placement of products into aisles, and shelf location [125]. Australian research identified less than half of the packaged foods commonly available in supermarkets were healthy [16].

The power of supermarket chains extends beyond retailing into manufacture, with the introduction of supermarket own brand foods [322]. Supermarket own brand foods (also known as private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers, wholesalers or distributors and are sold privately in their own stores [27]. They are widely available in Australian supermarkets and around the world [28, 29]. There is wide acceptance of supermarket own brands [274] and they are predicted to reach 35% of Australian grocery sales by 2020 [124]. The highest proportion of supermarket own brand products are found in the UK, Spain and Switzerland where they account for 40-45% of national grocery sales [126]. Supermarkets have control over own brand products, and can determine the choice of ingredients and nutritional content [24], which presents an opportunity for public health professionals to work with supermarkets to improve the nutritional quality of the food supply [11]. However, to date few studies have examined the availability, nutritional quality, price, placement or promotion of supermarket own brand foods in Australia, or elsewhere.

Development of own brand foods is a marketing strategy used by supermarkets to meet a range of objectives which vary according to the product or category. Globally, supermarket own brands have been most successful in high-purchase categories such as bread, milk and eggs; and the categories where consumers perceive little difference when compared with branded products (e.g. canned vegetables) [126]. Supermarket own brands have evolved over time, and now dominate new product launches, aiming to meet consumer demands for convenience and ready-prepared foods [247].

Assessment of the nutritional quality of supermarket own brands has found inconsistent results. Australian research comparing the nutritional quality of supermarket own brands to branded products concluded they could not be described as nutritionally inferior [31], while a more recent study found the mean sodium content was 17% lower compared to branded products from the same categories [30]. A Dutch study found there was no nutritional difference between supermarket own brand foods and branded foods, apart from for sodium where the branded foods contained significantly less [32]. Studies in the UK [33], Spain [34], and Ireland [35] have found no difference in nutritional content between supermarket own brand products and the branded equivalent.

Very little research has investigated the provision of nutrition information on supermarket own brand foods. One Australian study found the only products consistently following the food industry's voluntary front-of-pack labelling guidelines [135] were supermarket own brands [323].

Supermarket own brand foods will inevitably displace some branded products. Therefore, assessment of the nutritional quality of supermarket own brand foods is needed to enable public health professionals to provide sound advice on their place in the diet.

Australian research shows a significant cost saving for consumers who purchase supermarket own brand foods, making them an appealing option for the budget-conscious. The Food Access and Costs Survey in Western Australia (WA) found that the price of 2013 *Healthy Food Access Basket* was lower when supermarket own brand products replaced the branded equivalents [37]. The biggest cost savings were for breads and cereals (16%) and dairy (13%) due to the availability of supermarket own brand options in these categories [37]. Supermarket own brand products in the Netherlands [32] and France [138] were also significantly cheaper than the branded equivalent. A UK study found supermarket own brand foods provided consumers with better 'value for money', a measure which combined price and nutritional quality [33]. It is important to continue to monitor the price incentive offered by supermarkets to consumers to purchase own brand foods.

To date, no studies have been identified that investigate the placement or promotion of supermarket own brand foods in retail food environments. Australian studies of the placement and promotion of snack foods have highlighted public health issues relating to promotion of foods to children [83, 84] and the prominence given to foods classified as 'discretionary' [14, 15]. Given the increasing prominence of supermarket own brand foods, the lack of investigation regarding their contribution to these public health issues is an important gap in knowledge.

A number of survey instruments have been developed to assess and compare retail food environments within supermarkets [98, 99]. A systematic review of available measures recommended that researchers select an existing quality assessed tool where possible [100] and that the survey instrument needs to reflect the purpose of the assessment [99]. The widely used United States (US) developed Nutrition Environment

Measures Survey in Stores assesses availability of specified healthy options, price and quality [101]. The UK Consumer Nutrition Environment Assessment Tool measures healthfulness of supermarkets, including product variety, price, promotion, shelf placement, store placement, quality, healthier alternatives, nutrition information, and single fruit sale [13]. The US-developed 'GroPromo' tool measures product placement and promotion [102]. In Australia, the triennial Food Access and Costs Survey monitors the cost, variety, fresh food quality, availability and nutrition content of 430 foods in stores throughout Western Australia [37]. What is missing is a comprehensive assessment tool that includes the full marketing mix (i.e. product, price, placement, promotion) and describes the contribution of supermarket own brand foods to the healthfulness of retail food environments [11]. The overarching research question this study aims to address is: What is the extent and nature of supermarket own brand foods in Australia?

3.5.3 Methods/Design

3.5.3.1 Study aim

Supermarkets have access to a wealth of information to inform business strategy that directly influences consumer purchasing behaviour and food choice. This information is not readily available to researchers and policy makers. A better understanding of the marketing techniques used by supermarkets within stores to influence consumer purchases of own brands is needed. The aim of this protocol is to describe the methods developed to examine the availability, nutritional quality, price, placement and promotion of supermarket own brand foods within Australian supermarkets.

This study is unique as it aims to investigate all aspects of within-store retail food environments (i.e. product, price, placement, promotion) and address the contribution of supermarket own brands. This protocol could be used to assess supermarket own brand foods in other countries, or to assess the contribution of selected products or brands within retail food environments. It will enable researchers to identify supermarket own brand marketing practices of public health concern, and opportunities for interventions to improve the contribution of own brands to healthful retail food environments in Australia.

The Standard Protocol Items: Recommendations for Interventions Trials (SPIRIT) checklist [324] was used to guide this study protocol, adapted to accommodate the observational study design (Table App 7.4).

3.5.3.2 Setting

Selecting supermarkets

One of each major supermarket chain in WA, i.e. Coles Supermarkets Australia Pty Ltd (Coles), Woolworths Supermarkets (Woolworths), and IGA Supermarkets (IGA), were selected. Woolworths and Coles account for 70% of supermarket sales in Australia [124], and are managed from central support offices to maintain general consistency. IGA supermarkets are a heterogeneous mix of store formats owned and operated independently which contribute a low overall share of grocery sales, but represent over 50% of stores in WA [37]. Aldi was excluded from this audit due to the limited range of all products sold compared to the large supermarket chains [325].

Selected supermarkets were conveniently located in Perth, Western Australia. The outlets were selected on the basis of being 'optimised' supermarkets, i.e. they were large chain supermarkets with an increased likelihood of stocking most of the own brand product range, and the most up-to-date layouts and displays. The selected Woolworths 'next generation' store had been recently extensively refurbished [326]. The selected IGA was an 'IGA store of the year' for Western Australia. The selected Coles was the nearest large store to the parent company Wesfarmers' offices in Perth. These stores should therefore provide good representation of how the supermarket chains would like their stores to look, with well stocked shelves and visually appealing displays.

Each of the supermarket chains was contacted to request assistance in identifying supermarket own brand foods and non-alcoholic beverages (referred to as food hereon in). One supermarket provided detailed information of the own brand product range along with ingredients and nutrition information. Another supermarket chain provided a list of the top selling own brand products and the third supermarket chain declined to provide any information. Permission to conduct the audits was also requested, and support was given by each of the supermarket chains. Final permission was sought

from the store manager of the selected supermarkets prior to and during the time of the audits.

Identifying supermarket own brand products

Supermarket own brand products were identified as those products carrying the supermarket's branding on the front-of-pack. 'Phantom brands' are owned by supermarket chains but made to appear as if they are not associated with them [327]. Due to lack of association with the supermarket chain on the front-of-pack, it is very difficult to identify these products. Therefore, this study only included the brands that were clearly identified on front-of-pack as owned by supermarkets. Online shopping websites were used to generate product lists to assist with identifying supermarket own brand products in two of the supermarket audits. The third supermarket did not provide this information online.

All supermarket own brand foods present in the three selected supermarkets were audited, including packaged foods and pre-packed fresh products such as fruits, vegetables and meat that carried a supermarket own brand on the label. Forty-three supermarket own brands were identified across the three supermarket chains, the main ones were: Coles, Black & Gold, Community Co., Woolworths, Woolworths Select, and Macro.

Identifying retail food environments attributes that can influence food selection

The within-store marketing mix of product, price, promotion and placement were classified into 13 attributes including: (a) product availability and quality; (b) product assortment; (c) design of products and packaging; (d) nutritional quality; (e) provision of supermarket own brand products; (f) pricing strategy; (g) price sensitivity and elasticity; (h) price promotions; (i) in-store location; (j) shelf location; (k) health messages; (l) promotions targeting children; (m) other promotions, adapted from the work of Glanz *et al.* [10, 11]. Information relating to 12 of the 13 attributes were collected in the audit. One attribute, price elasticity, which examines the impact of changes in price on consumer buying behaviour, was not measured as it cannot be collected via a store audit.

3.5.3.3 Study design

Information audited

The following information was collected during supermarket audits for all own brand food products present:

- Front-of-pack product information including own brand name, product name, product description, pack weight, whether the pack was a multi-pack;
- Design of packaging and label including identification of the country of origin (e.g. Australia made triangle), attributes related to value and convenience;
- Shelf-edge label information including whether it displayed kilojoules, the standard selling price, promoted price, promotion details (e.g. multi-buy, discount, everyday low pricing);
- Placement of the product, including where it was located within the store, on shelf, and the prominence it was given (e.g. using ends of aisles, or placing products at eye level);
- Promotion on the front-of-pack, including presence of supplementary nutrition information (i.e. Health Star Ratings [53] or Daily Intake Guide [135]), nutrition claims, health claims, health marketing techniques, promoting products to children [108], and consumer values issues (e.g. statements and claims about suitability for special diets or animal welfare) [276].

Other sides of own brand packaging, including the back-of-pack, were not collected during the supermarket audits due to time constraints. Back-of-pack information typically includes the barcode, ingredients list, nutrition information panel, and allergen declaration.

In-store photography

Photographic images were taken to record the product attributes as quickly as possible as there are constant changes taking place in supermarkets: products are deleted, new products are launched, prices change, price promotions are implemented on a weekly basis, and there are seasonal changes in availability of fresh produce and other products (e.g. Easter eggs). Photographic methods enabled quick data collection and have been used to assess and monitor packaged foods in supermarkets previously. Photographic audits are less expensive and a more efficient way of collecting product information

within supermarkets, compared to purchasing products or completing paper-based surveys [328].

Data collection

Two researchers visited each store together, during a 3-week period commencing in February 2017. This date was selected to avoid the changes that occur in supermarkets during the Christmas and Australian summer holiday period, and prior to Easter. Data collection took a total of eight days; three days in two stores, and two days in the final store. Audits commenced upon store opening in the morning to minimise disruption to the stores, and were ceased if the stores became too busy to photograph products unobtrusively.

For quality control, each of the stores was divided into product zones based on the physical location of products (e.g. fresh produce, frozen food) and each researcher photographed the zones they were designated. Photographs were taken to show the location of the product display within the store, the location of products on each of the shelves, and the use of any display materials such as shelf-edge labelling or large signs. The front-of-pack and shelf-edge label for each supermarket own brand product identified was photographed. For products that were not available, photographs were taken of the empty product space and shelf-edge label and products were photographed at a later date, if present during the audit period. Products that were not present throughout the audit period were not included in this study.

At regular intervals both researchers walked through the zones together to check that all products had been identified and photographed. This was done by referring to the product lists generated prior to conducting the supermarket audits, and by examining the products available. Any missed products were photographed during this process. Breaks were also taken at regular intervals to upload and back-up photographs to a laptop computer. At the end of each day photographs were reviewed for legibility, and any illegible photographs that could not be used were listed and retaken the following day. Photographs were date and time tagged by the devices used.

Supermarket own brand ready-to-eat or ready-to-heat mixed food products that require refrigeration, for example chilled ready-meals, were photographed in-store as part of

standard data collection, and then purchased to enable further photographic collection of information provided on the back and sides of the packages.

Purchased products were photographed in a food sensory laboratory at Curtin University. Each chilled convenience product was assigned a code, which was visible in the photographs and recorded on a spread sheet. This code ensured easy identification of the product and associated supermarket, and prevention of product misrecognition during data extraction, particularly for the back of pack images. To prevent food waste, the chilled, un-opened products were delivered to a local food charity to redistribute.

3.5.3.4 Data management

Database and data extraction

An electronic computer filing system was established for each of the supermarkets, with folders for each of the 18 product zones, or food groups, identified in the supermarkets. Product and display photographs were filed accordingly.

A database was constructed to enable systematic entry of store audit photographs information using Microsoft Excel (Version 2013, Redmond, Washington, USA). Each supermarket was assigned a separate spreadsheet, with separate worksheets created for each of the 18 product zones, or food groups, (e.g. frozen food). Product groups were identified for each zone, so that products could be allocated to a group (e.g. ice cream). Pre-coded responses were established for each of the columns for data entry, to enable consistent classification across supermarkets, product areas, and between researchers. Free text was permitted for product name, product description, price, promoted price, shelf position details, location prominence details, and columns for details relating to each of the promotions data. The researchers who conducted the supermarket audits completed data entry.

The first product zone, or food group, for the first supermarket was piloted to ensure all necessary information was collected, and establish any final changes needed to the pre-coded responses. After completing data entry, both researchers reviewed the data and changes were implemented by the first author as required to ensure consistency of approach. Specific procedures for classification of product nutritional quality were developed which are addressed below.

3.5.3.5 Assessment procedures

Front-of-pack product information

Information was extracted from the supermarket own brand front-of-pack photographic images including: product name, product description, whether the product was a pack containing multiple units (i.e. multipack), and the pack weight or volume and entered directly into the database. Products were assigned to one of 18 food groups, and one of 130 product groups (see Table App 7.5).

Shelf-edge label information

Information was extracted from the shelf-edge label photographic images including: the standard price per pack, promoted price per pack, price promotion details, and whether kilojoule labelling was present, and entered directly into the database. Price per 100 grams or 100 millilitres, and price per item for multipacks were calculated. Price promotions were classified according to the key message used including: half price, every day, locked down low prices, special, value, multi-buy offers, and percentage off discounts.

Design of label and packaging

In Australia, packaged foods must carry a statement identifying the country where the food was made, produced or grown, or manufactured or packaged [329]. The audit collected the design attributes used on the front-of-pack and shelf-edge-labels to identify foods as Australian including: Australian flag, map or outline of Australia, the Southern Cross stars, the Australian made triangle, the updated Australian made triangle with a ruler depicting the proportion of ingredients that are Australian, or stating Australia in the product title or description.

Supermarket own brand foods initially provided a low quality unbranded alternative to branded products at a lower price [129]. Techniques used on supermarket own brands to communicate value for money were identified on the photographic images including: use of plain packaging or few colours, price marked packs, use of promotional stickers, and using words to indicate value.

Techniques used on supermarket own brands to demonstrate convenience were identified in photographs including: single-serve packs, packaging with cutlery

included, packaging that reveals ready-to-eat or ready-to-heat foods that require little effort to prepare, foods presented in convenient packaging formats such as oven-ready trays or microwavable or resealable containers, and words used to convey the speed of preparation.

Placement of the product

When shoppers notice a product, they are more likely to buy it [330] therefore high footfall locations within the store such as ends-of-aisles and the entrance can impact consumer purchases. For this audit, the in-store location was recorded including whether the product featured on a special display.

Products are also more likely to be purchased when placed in prominent shelf positions such as at eye level [331]. An existing audit tool, the Consumer Nutrition Environment Assessment Tool, included criteria to identify the most prominent shelf at eye level, the least prominent at the bottom of the display, and other shelves classified as less prominent [13]. This current protocol adapted the classification to include the range of display units present in the supermarkets, such as market-style bins and refrigerated barges, identifying the most prominent, least prominent, and less prominent shelf positions.

For prominence, a number of techniques were identified during the audits, including highlighting the product location with signage such as shelf stripping or signs, displaying the own brand products together creating an 'own brand block', displaying the same own brand product in more than one location, and placing own brand products adjacent to the higher profile branded equivalent.

Product promotion on the front-of-pack

A taxonomy of nutrition and health related packaging information to identify supplementary nutrition information, nutrition claims, health claims, and marketing statements and claims has previously been constructed [108] and was utilised for this study (Figure App 7.1). Three additional marketing techniques used by supermarket own brands to appeal to children were identified in this audit: mini or child portioned packs, reference to children or 'kids' in the product name or branding, and placement of a supermarket own brand product adjacent to a similar branded child-targeted product.

Supplementary nutrition information on the front-of-pack is voluntary in Australia. There are two commonly applied systems: the government-led Health Star Ratings (HSR) and the food industry-led Daily Intake Guide (DIG). The HSR was designed to be applied to packaged processed foods and uses an algorithm to assign each product a score from ½ to 5 health stars, with 5 stars indicating the healthiest choice [53]. The product can feature one of three versions of the device which include (a) the HSR only, (b) the HSR plus kilojoules per 100 grams, or (c) the HSR plus kilojoules, saturated fat, sugars, sodium per 100 grams and an optional nutrient [332]. The DIG provides nutrition information on the front-of-pack. There are two versions which can be applied: (a) the DIG thumbnail icon displaying kilojoules per serve; and (b) the DIG preferred format of kilojoules, fat, saturated fat, sugars and sodium per serve [333]. This audit identified presence of the following from the front-of-pack photographs: HSR only, HSR plus kilojoules, HSR plus kilojoules and nutrients, the DIG thumbnail, the DIG with nutrients, a nutrition information panel, or an ingredients list.

An Australian independent review of food labelling law and policy identified 'consumer values issues' as issues of importance to consumers but not directly affecting health [276]. Communication of consumer values issues on the front-of-pack were identified in this audit including: organic food, food containing no MSG, beef with no growth hormones, and food containing no artificial colours or flavours.

Supermarket corporate social responsibility (CSR) statements made on the front-of-pack were also identified and a free text column provided to note the details including: commitments to sustainable fishing practices and supporting local farmers.

Nutritional quality

Products were assessed for nutritional quality using the front-of-pack information collected during the audits. The HSR was noted as provided on pack, and it was not calculated for products that didn't display the device. Products were classified into food groups consistent with the Australian Guide to Healthy Eating (AGTHE) [3], the NOVA classification of level of food processing [67], and the expanded classification of level of food processing developed by Poti *et.al.* (2015) which includes three levels of convenience [73].

The NOVA classifications were referred to for classification of the supermarket own brand products [67] and the Poti *et al.* category definitions and criteria were used to classify foods based on the level of industrial processing and the amount of preparation required by the consumer [73].

Classifying foods according to the AGTHE proved more problematic as the examples provided in the Educators Guide [227] are limited to whole foods, not meals or mixed foods, and provide overarching principles that can be applied to dietary analysis more easily than packaged food categorisation. The Australian Bureau of Statistics (ABS) established principles for identifying 'discretionary foods', not essential for a healthy diet, in order to conduct analysis of the national food and health survey [228]. This method was adapted as there were many ready-to-eat products in the audit which were not addressed by the ABS criteria. A decision tree was constructed to enable categorisation of products in accordance with the principles of the AGTHE, with the addition of two new groupings: 'Mixed products using mainly five food group foods', and 'Mixed products high in fat, salt or sugar' (Table 3.1).

3.5.3.6 Data analysis

Approximately 20,000 photographic images were collected for 3940 supermarket own brand foods in the audit, and details recorded in the database. There were 1812 supermarket own brand foods present in the Woolworths store, 1731 supermarket own brand foods in the Coles store, and 397 supermarket own brand foods in the IGA store. Research questions relating to 12 of the 13 attributes of within-store retail food environments have been identified (Table 3.2). All data will be entered into SPSS for Windows (Version 24, Released 2016, IBM Corp., USA) and summarised using descriptive statistics, frequencies and presented graphically using bar charts

.

Table 3.1 Procedure to classify foods consistent with the Australian Guide to Healthy Eating

Question	Details	If yes…	If no or unsure…
Q1. Is the product easily identifiable as a five food group food, or water?	Vegetables - All fresh, frozen, canned and dried, but not fried Fruit - All fresh, frozen, canned, dried, and fruit juice Grains - Whole and rolled grains, flour, bread, pasta, noodles, breakfast cereals, including refined and whole grain varieties Lean meat, fish, and alternatives - All fresh, frozen and canned meat, poultry and fish; salt and fat reduced sausages; eggs, tofu, nuts and nut spreads, legumes, seeds Milk, yoghurt, cheese, and alternatives - Fresh, dried, evaporated or UHT milk, yoghurt, all cheese, and calcium-enriched alternatives Water	Classify into the appropriate food group	Go to Q2
Q2. Is the product easily identifiable as a discretionary food, using the examples provided in the Eat for Health Educators Guide?	Foods with higher added sugars - energy drinks, fruit drinks, honey, jams, marmalade, some sauces, sports drinks, sugar, confectionery, soft drinks, cordials, sweetened waters, iced tea, syrups Foods with higher saturated fat - bacon, ham, butter, cream, ghee, some tacos/nachos/enchiladas, commercially fried foods, commercial burgers, crisps, extruded snacks, dairy blends, frankfurts, chips, meat pie, pasties, pastry, pizza, processed meat, quiche, salami, mettwurst, sausages, some crackers, some sauces, spring roll	Classify as discretionary	Go to Q3

Question	Details	If yes…	If no or unsure…
Q2. (continued)	Foods with higher saturated fat and added sugars - biscuits, cakes, chocolate, chocolate bars, dessert style custards, doughnuts, iced buns, ice cream, muesli bars, puddings, slices, some confectionery, some sauces, muffins, pastries, pies, crumbles Foods with high salt - marinades and sauces e.g. fish sauce, soy sauce; salty snack foods; spreads e.g. Vegemite; savoury biscuits		
Q3. Do the ABS principles for identifying discretionary foods identify this food as discretionary?	All milk drinks including flavoured milk	Classify as milk, yogurt, cheese and alternatives	Go to Q4
	All soft drinks including those with intense sweeteners All fruit drinks other than fruit juices Tea or coffee with added sugar Breakfast cereals without added fruit > 30g sugar/100g Breakfast cereals with added fruit > 35g sugar/100g All dry soup mixes	Classify as discretionary	
	Mixed dishes containing grains e.g. sandwiches, burgers, wraps, sushi, pizza >5g saturated fat/100g	Classify as ‘mixed product high in fat salt or sugar’	
Q4. Does the product contain any of the following: added saturated fat, added salt, or added sugar?	added saturated fat e.g. butter, cream, coconut milk/cream, mayonnaise added salt e.g. marinades, soy/fish sauce, stock/bouillon added sugar or other sweeteners e.g. honey, syrups	Go to Q5	Classify as 'mixed product using mainly five food group foods'

Question	Details	If yes…	If no or unsure…
Q5. Does the nutrition content of the product meet any of the following criteria from the Eat for Health Educators Guide?	-- total fat > 10g per 100g -- saturated fat > 3g per 100g -- total sugar > 15g per 100g -- sodium > 400mg per 100g	Classify as discretionary or 'mixed product high in fat salt or sugar'	Go to Q6
Q6. Is there enough information provided to classify the product as five food group foods or mixed product using mainly core foods?	For products where only front-of-pack information is available, products will be classified as discretionary/ mixed product high in fat salt or sugar unless there is sufficient information to classify it as five food group food/ mixed product using mainly five food group foods	Classify into the appropriate food group, or as 'mixed product using mainly five food group foods'	Classify as discretionary or 'mixed product high in fat salt or sugar'

Table 3.2 Relationship between within-store retail food environment attributes, research questions, and data collection for the Supermarket Nutrition Environment Assessment Tool – Supermarket Own Brands

Attribute[#]	Research questions	Data required
Product		
(a) Product availability and quality	• What is the availability of healthy and unhealthy own brand foods in Australian supermarkets? • What proportion of supermarket own brand foods are Australian made?	Supermarket own brand name, product name, product description, pack size, pack weight, price, price promotion, Australia made logo, Australia included in product title or description
(b) Product assortment	• How many supermarket own brand foods are available? • How much variety of supermarket own brand foods is available i.e. breadth of choice across categories and depth of choice within each category, particularly in ready-to-eat foods?	Products assigned to one of 18 food groups, and 131 product groups
(c) Design of products and packaging	• How many own brands are used by Australian supermakets? • What supplementary nutrition information is made available on front-of-pack of supermarket own brands? • What is the prevalence of messages promoting value or convenience on supermarket own brand foods?	Supermarket own brands packaging design techniques including words/ colours/ images promoting value or convenience, front-of-pack supplementary nutrition information
(d) Nutritional quality	• What supermarket own brand foods are available in each of the AGTHE food groups? • How do supermarket own brand foods rate using the HSR system? • What is the prevalence of healthy lines of supermarket own brand foods? • How are supermarket own brand foods categorised using the NOVA system?	Supermarket own brands to be classified using the AGTHE and NOVA using front-of-pack information only; HSR to be recorded from front-of-pack
(e) Provision of supermarket own brand products	• What is the prevalence of supermarket own brand ethically sourced foods? • What is the prevalence of supermarket own brand convenience foods?	Supermarket own brand statements and logos relating to ethical food standards; messages and design techniques relating to convenience

Attribute[#]	Research questions	Data required
Price		
(f) Pricing strategy	• How does the price of healthy supermarket own brand foods compare with unhealthy own brand foods?	Analysis using price and nutritional quality data
(h) Price promotions	• How are supermarket own brand foods promoted using price? For example, using price reductions, multi-buy offers, everyday low pricing, coupons, and price marked packs. • How does price promotion of healthy supermarket own brand foods compare with unhealthy own brand foods?	Analysis using supermarket own brands price promotion techniques and nutritional quality data
Placement		
(i) In-store location	• Where are supermarket own brand foods physically located within stores? For example, are any at the ends-of-aisles, at checkouts, in island dump bins? • What is the prevalence of co-locating supermarket own brand foods adjacent to the branded equivalent?	Supermarket own brands physical location in store, including whether on the perimeter of the store, or the aisle
(j) Shelf location	• How prominently located are supermarket own brand foods? • How is supermarket signage or décor used to give supermarket own brands prominence?	Supermarket own brands prominence in store, including whether in blocks, at eye level, large number of shelf facings, and signage or décor
Promotion		
(k) Health messages	• How is supermarket own brand packaging information classified using a taxonomy of nutrition and health related packaging information? • How are the quality standards applied to supermarket own brand foods communicated to shoppers? • How are the ethical standards applied to own brand foods communicated to shoppers?	Marketing techniques and nutrition and health statements and claims, logos or statements about product quality or quality standards in general, and logos or statements about ethical standards
(l) Promotions targeting children	• What is the prevalence of supermarket own brand foods designed to appeal to children? • What proportion of supermarket own brand products designed to appeal to children can be described as healthy?	Marketing techniques designed to appeal to children (included in the taxonomy above); analysis of the nutritional quality of selected products

Attribute[#]	Research questions	Data required
(m) Other promotions	• What other techniques are used on supermarket own brand products?	Information from the front-of-pack of supermarket own brands

3.5.4 Discussion

The aim of this protocol was to describe the methods developed to examine the availability, nutritional quality, price, placement and promotion of supermarket own brand foods within Australian supermarkets. This study aimed to investigate all aspects of within-store retail food environments and address the contribution of supermarket own brands.

Supermarket outlets operated by the large chains are managed from central support offices for consistency, but are not homogenous as the products and services may differ by store [12]. The International Network for Food and Obesity Research Monitoring and Action (INFORMAS) recommends monitoring food availability in predominant food environments [66]. The supermarkets selected for this study were 'optimised' to reflect the way the chains would like stores to look. This approach was taken so that the study would provide information about a wide selection of supermarket own brand foods, and how they are marketed. Other approaches could be taken for audits, including selecting stores based on the socio-economic profile of the neighbourhood, or level of geographic isolation.

Supermarket own brand products were selected as the focus of this study as little is known about their availability, nutritional quality, price, placement or promotion. In Australia, powerful supermarkets control own brand products [322] and implement corporate social responsibility (CSR) initiatives to manage their impact on the communities where they operate [334, 335]. In a neoliberal political context, whereby government regulation is minimized to promote free trade [40], consumers rely on such voluntary measures to support public health. International examples of supermarket CSR initiatives that impact public health include: banning the sale of energy drinks to children [336]; removing lunchbox-sized sugar sweetened beverages from sale [337]; introducing a supermarket-wide shelf-edge labelling system that identifies healthy foods [301]; and improving the nutritional quality of own brand foods [48, 49]. Interventions in supermarket settings are generally effective in improving food purchasing patterns,

and can play a role in protecting public health [18-20]. Therefore, findings from this study will assist researchers in identifying own brand marketing practices of public health concern, and opportunities for interventions to make improvements. Supermarket CSR initiatives will be recommended, for example making targeted changes to own brand foods that can improve the nutritional quality of the food supply [11]. The protocol of this study could be adapted for other countries with high proportions of supermarket own brand products (e.g. Spain, the UK, Switzerland [126]) with results used in a similar way.

This research protocol could also be adapted to understand how supermarkets market other products (e.g. sugar sweetened beverages and energy drinks) or brands (e.g. Nestle), or identify marketing techniques used to appeal to children. The INFORMAS recommendations for advocacy initiatives to promote public health include holding companies, such as food manufacturers and supermarkets, to account for actions that impact public health [338]. This can be done by naming and shaming poor practice, or acknowledging and praising good practice [338]. This advocacy strategy recognises that food companies, including supermarkets, have the collective power to improve food environments and assist consumers to select healthy foods [55]. Adapting this study's protocol to conduct within-store audits of specific products or brands could assist with identifying marketing practices of concern to public health, as well as CSR initiatives that have had a positive impact.

Existing assessment tools were referred to in the construction of this protocol. However, no tool was identified that evaluated the full marketing mix and nutritional quality of selected products within retail food environments (Table 3.3). The UK Consumer Nutrition Environment Assessment Tool included criteria to identify the most prominent shelf placement and store placement. The WA Food Access and Costs Survey included key variables for price, promotions, availability, and nutrition content [37]. Previous work on a smaller product sample informed the nutrition and health related data collected [108].

Table 3.3 Within-store retail food environment attributes examined in key survey instruments

Attribute[#]	Nutrition Environment Measures Survey – Stores (NEMS-S) [101]	Gro-Promo [102]	Consumer Nutrition Environment Assessment Tool [13]	Food Access and Costs Survey (FACS) [37]	Supermarket Nutrition Environment Assessment Tool – Supermarket Own Brands
Product					
Product availability and quality	✓	-	✓	✓	✓
Product assortment	✓	-	✓	-	✓
Design of products and packaging	-	-	-	-	✓
Nutritional quality	✓	-	-	-	✓
Provision of supermarket own brand products	-	-	✓	✓	✓
Price					
Pricing strategy	✓	-	✓	✓	✓
Sensitivity and elasticity	-	-	-	-	-
Price promotions	-	-	✓	✓	✓
Placement					
In-store location	-	✓	✓	-	✓
Shelf location	✓	✓	✓	-	✓
Promotion					
Health messages	-	-	-	-	✓
Promotions targeting children	-	✓	-	-	✓
Other promotions	-	✓	-	-	✓

#Attributes adapted from Glanz and colleagues [10, 11]

Assistance was provided by two of the three supermarkets included in this study. The product lists provided were not as helpful as they first seemed. One supermarket chain provided information about all existing own brand products. However, it is unlikely that any supermarket outlet would stock all currently available products. The list included products being phased out, new products not yet launched, and seasonal products that are only available at certain times of the year. Due to the long distances between food producing areas and urban centres in Australia [241] each State or Territory can stock locally produced foods not available elsewhere. Some products were identified as not available by the empty space on the shelf during the audit. When products are not available for more than a few days the space is likely to be filled with other products and the shelf-edge label removed. A second supermarket chain provided a list of top selling products, and similar problems were encountered during the audit. The researchers used the lists provided by supermarkets as guidance to the names of the own brands and the types of categories where products would be present. The product lists generated from the shopping websites were more useful, but did not include all supermarket own brand products present in the stores audited.

Researchers were sensitive to the needs of supermarket staff and customers, and timed the audits to avoid peak shopping times. Use of photographic images proved to be a quick and efficient way of collecting data unobtrusively. Photographs were taken to show the location of the product display within the store, location of products on shelves, use of display materials, and the front-of-pack and shelf-edge label for each supermarket own brand product identified. Regular review of the photographs for legibility was essential, so that gaps in data could be filled during the audits. Whilst the photographic images from the audits were legible, sometimes the angle of a photograph missed an important variable. For example some front-of-pack images showed products displayed in a shelf ready carton where supplementary nutrition information was not visible. To fill these gaps researchers searched for missing packaging information on the supermarket shopping websites, or in a local supermarket.

This protocol has a number of strengths and limitations. The extensive nature of the data collected is likely to provide great insight into the contribution of supermarket own brand foods to the healthfulness of retail food environments in Australia. The study utilised a detailed taxonomy which had already been tested and applied to a

smaller sample of products. The protocol may be adapted for use in other countries with high proportions of supermarket own brand foods, or to evaluate the contribution of other significant product groups or brands to within-store retail food environments. The protocol described in this study took place with support from the central office of each supermarket chain, and permission was granted by the store managers. This was despite initial reluctance to allow photography in one of the stores. Without permission from supermarkets for photography, data collection of this scale would not be possible. Even so, due to the large number of products audited there is a possibility that some supermarket own brand foods were missed. The systematic data collection using photographic methods proved to be quick and efficient. Data management of the photographs into a designated electronic filing system was essential and proved effective. However, gaps in information were identified during data extraction and needed to be filled using suitable alternative sources including the supermarket shopping websites. Data collection of branded products was not included in this study protocol, as that was not the purpose of this study. Future within-store audits of supermarket own brand foods could include the branded equivalents to enable analysis of the similarities and differences in the marketing techniques employed.

3.5.5 Conclusion

This protocol describes the methods developed to examine the availability, nutritional quality, price, placement and promotion of supermarket own brand foods within Australian supermarkets. This is important because Australian supermarkets hold a powerful position as primary gatekeepers of the food system, and consumers rely on their voluntary CSR initiatives to support public health. However, little is known about the availability, nutritional quality, price, placement or promotion of supermarket own brand foods. Existing survey instruments do not comprehensively assess the full marketing mix (i.e. product, price, placement, promotion) or describe the contribution of specific foods, such as supermarket own brand foods, to the healthfulness of retail food environments. Therefore, this protocol describes methods for collecting the data required to assess all aspects of within-store retail food environments using photographic images. Analysis of findings of the 20,000 photographic images for 3940 foods will enable researchers to identify own brand marketing practices of public health concern, and opportunities for interventions to improve the contribution of supermarket own brands to healthful retail food

environments in Australia. Supermarket CSR initiatives that can have a positive impact on public health will also be recommended. The study protocol could be adapted for other countries with high proportions of supermarket own brand foods (e.g. Spain, the UK, Switzerland) with results used in a similar way. It could also be adapted to understand how supermarkets market other products (e.g. sugar sweetened beverages and energy drinks) or brands (e.g. Nestle), or identify marketing techniques used to appeal to children. Dissemination of results to public health researchers and policy makers will enable full evaluation of the protocol's utility.

3.6 Content analysis of supermarket corporate social responsibility commitments that can impact public health: Studies 7 and 8

To compare the supermarket audit findings to the international supermarket sector, CSR commitments from the world's largest supermarkets, which includes the Australian chains, were identified and the content of company reports was analysed. For study 7, which aimed to investigate publicly available CSR commitments that impact public health by the world's largest and most powerful supermarkets, all identified supermarket CSR information was included. For study 8, which aimed to identify Australian supermarkets' public health nutrition-related CSR commitments and evidence of practice, only the information for Coles and Woolworths was included (along with wholesaler Metcash). For both studies, a political CSR lens guided analysis of supermarket CSR commitments. Political CSR theories refer to the power held by large companies which demands they act responsibly [59] as good corporate citizens [58].

For study 7, the world's largest one hundred retailers (of all types) were identified using the 2018 *Global Powers of Retailing* report [339]. The list included 44 supermarket chains, hypermarket chains, and discount supermarket chains (referred to as supermarkets henceforth). Reports in languages other than English were excluded for practical reasons, which meant 31 supermarkets were included in the study. Websites for each of the selected supermarkets were searched for company reports referring to CSR or sustainability. The Global Reporting Initiative's Sustainability Disclosure Database [340] was also searched to identify whether CSR reports had been lodged by the supermarkets, and whether they were in the recommended format (i.e. GRI-G4). Corporate reports that referred to CSR or sustainability were identified and included as research materials. A framework was developed to analyse the CSR reports based on evidence of how supermarket power impacts public health [322]. Content analysis of CSR reports identified themes relating to the following 14 attributes: general governance, influencing policy, setting supplier rules, influencing livelihoods, influencing communities, accessibility, availability, food cost and affordability, food preferences and choices, food safety and quality, nutritional quality,

animal welfare, food and packaging waste, and other sustainability issues. Further details of the study methodology are provided in Chapter 6.

For study 8, websites for supermarkets Coles, Woolworths and IGA, and wholesaler Metcash were searched for company reports and other information referring to CSR or sustainability (e.g. news releases, supermarket own brand information on shopping websites, and CSR updates provided in addition to company reports). Content analysis of the CSR research materials was conducted by identifying commitments that relate to the public health nutrition attributes of: accessibility, availability, cost and affordability, food preferences and choices, food safety and quality, nutritional quality, animal welfare, food and packaging waste, and sustainable sourcing. Evidence of CSR practice were derived from findings of the supermarket audits. Further details of the study methodology are provided in Chapter 6.

3.7 Summary of the chapter

This chapter described the mixed-methods used to meet the overarching research aim, which was to examine Australian supermarkets' CSR commitments to public health, and evidence of practice, by analysing the contribution of supermarket own brand foods to Australian consumer nutrition environments. It described methods for the systematic scoping reviews, audit of packaging information, focus groups with parents, supermarket audits, and content analysis of supermarket CSR commitments, which were used for the eight studies included in this thesis. The multistage mixed-methods approach allowed for the findings of each study to be reported in turn, and to inform the other studies in the following way.

- Study 1 identified 13 sub-domains of consumer nutrition environments, 12 of which were used to inform the data collected in the supermarket audits in study 5 (an *exploratory sequential* design).
- Study 2 identified the pivotal role of supermarket own brand foods as both a source of power and impacting public health, which informed the focus for the supermarket audits in study 5 (an *exploratory sequential* design).

- Study 2 provided evidence of how supermarket power impacts food governance, the food system, and public health nutrition, which informed the thematic analysis of supermarket CSR commitments in study 8 (*integration* of methods through building, whereby one study informs another).

- For study 3, a taxonomy of nutrition- and health-related packaging information was created for the analysis, and also informed data collection and analysis for study 5 (*integration* of methods through building, whereby one study informs another).

- Studies 3 and 4 were conducted at a similar time (a *convergent* design).

- For study 4, trust in supermarkets was explored with parents of young children who discussed structural changes supermarkets could implement, as part of their CSR commitments, to support them to select healthy foods. This provided useful context when exploring CSR in studies 7 and 8 (*integration* of methods through building, whereby one study informs another).

- The extensive data collected from supermarket audits for study 5 were also used to conduct the analysis for study 6, and formed part of the data set for study 8.

- The findings from each of the studies will be reported in a staged way, and then integrated in chapter 7.

Chapter 4 RESULTS: SUPERMARKETS' ROLE IN ASSISTING CONSUMERS TO SELECT HEALTHY FOODS

This chapter includes a published manuscript and a manuscript that is under review:

Pulker CE, Scott JA, Pollard CM. Ultra-processed family foods in Australia: nutrition claims, health claims and marketing techniques. *Public Health Nutr*. 2018; 21: 38-48. (*Public Health Nutrition has an impact factor of 2.485*.)

Pulker, C.E., Ching Li, D.C., Scott JA, Pollard CM. The impact of corporate social responsibility on Australian parents' ability to select healthy foods: a qualitative study. **Under review**.

4.1 Overview of the chapter

The objective of this chapter is to investigate the role of Australian supermarkets in assisting parents to navigate common within-store marketing techniques to select healthy foods. Research questions were: (1) What voluntary nutrition and health labelling, claims and marketing techniques are present on high market share ultra-processed foods in Australian supermarkets? (2) Who do parents believe is responsible for giving them the information they need to make healthy food choices for their children? (3) What role do parents believe food companies should take in helping them select healthy foods for their children?

The chapter describes common within-store marketing techniques and parents' ability to select healthy foods. It identifies the difficulties consumers face when attempting to select healthy packaged foods, which provides context for the rest of the thesis. The influence of supermarket consumer nutrition environments over consumers' eating behaviour includes provision of nutrition information on products and packaging, as well as product availability, price, placement and promotions.

The chapter includes a published study which analysed nutrition claims, health claims and marketing techniques present on a sample of high-market-share Australian ultra-processed foods, and a qualitative study of the impact of corporate social responsibility on Australian parents' ability to select healthy foods, which is under review.

4.2 Publication #4: Ultra-processed family foods in Australia: nutrition claims, health claims and marketing techniques [1]

4.2.1 Abstract

Objective: To objectively evaluate the voluntary nutrition and health claims and marketing techniques present on packaging of high market-share ultra-processed foods (UPF) in Australia for their potential impact on public health.

Design: Cross-sectional.

Setting: Packaging information from five high market-share food manufacturers and one retailer were obtained from supermarket and manufacturers' websites.

Subjects: Ingredients lists for 215 UPF were examined for presence of added sugar. Packaging information was categorised using a taxonomy of nutrition and health information which included nutrition and health claims and five common food marketing techniques. Compliance of statements and claims with the Australia New Zealand Food Standards Code, and Health Star Ratings (HSR) were assessed for all products.

Results: Almost all UPF (95%) contained added sugars described 34 different ways; 55% of UPF displayed a HSR; 56% had nutrition claims (18% were compliant with regulations); 25% had health claims (79% were compliant), and 97% employed common food marketing techniques. Packaging of 47% of UPF was designed to appeal to children. UPF carried a mean of 1.5 health and nutrition claims (range 0-10), and 2.6 marketing techniques (range 0-5) and 45% had HSR ≤3.0/5.0.

Conclusions: Most UPF packaging featured nutrition and health statements or claims despite the high prevalence of added sugars and moderate HSR. The degree of inappropriate or inaccurate statements and claims present is concerning, particularly on packaging designed to appeal to children. Public policies to assist parents to select

[1] This is the accepted version of the following article: Pulker CE, Scott JA, Pollard CM. Ultra-processed family foods in Australia: nutrition claims, health claims and marketing techniques. *Public Health Nutr*. 2018; 21: 38-48, which has been published in final form at https://doi.org/10.1017/S1368980017001148.

healthy family foods should address the quality and accuracy of information provided on UPF packaging.

4.2.2 Introduction

Packaging of food and non-alcoholic beverages (referred to as *food* from here on in) is an important marketing tool used by manufacturers to communicate product attributes to potential consumers [341] with product claims a key feature [103]. A large proportion of supermarket purchases are made on impulse, and packaging has been shown to play a crucial role [86]. Shoppers typically make these decisions after only a few seconds to consider food labels [232]. The front-of-pack plays a vital role in capturing consumers' attention and influencing food preferences [103, 342]. Packaging design can also influence consumer perceptions of health through use of colour and graphical elements such as pictures or symbols [343, 344].

The global food supply has become more concentrated with major transnational food manufacturers becoming larger and more powerful [145, 345]. Researchers have accused the globalised food system, driven by large manufacturers and supermarket chains, of creating processed foods that are identical throughout the world [71]. They suggest that the extent and purpose of food processing forms the basis of a classification system for use in dietary guidance [74]. Industrially processed foods that include cosmetic or sensory additives such as colours, flavours, sweeteners, or processing aids, or undergo industrial processes which have no domestic equivalent such as extrusion, also referred to as ultra-processed foods (UPF), have been found to have higher saturated fat, sugar and sodium content compared to less processed foods [67, 73]. UPF have also been described as hyper-palatable products that are attractively packaged and aggressively marketed, including making use of health statements and claims [67].

In Australia, there is a high level of foreign ownership of food brands by transnational food manufacturers [143]. UPF are prevalent with annual retail sales per capita of 200.5kg in 2013, and Australia ranked sixth out of 80 nations for total annual UPF sales [78]. The majority (83%) of available packaged foods in New Zealand are UPF with multiple variations of the same product common [243]. In 2012, an Australian and New Zealand survey found that less than half of packaged foods could be described as healthy using a nutrient profiling tool [16].

In 2011-12 63% of Australian adults and 25% of children were overweight or obese, and 35% of the population's total daily energy intake came from energy dense nutrient poor 'discretionary foods' which are high in added sugars, fats, or salt [69]. These foods are more likely to be classified as UPF. Public health professionals agree that marketing of unhealthy foods, including via packaging plays a role [8, 45, 86, 105].

The Australian and New Zealand food regulatory system aims to protect public health and safety by providing sufficient information, prevent misleading information, and promote healthy food choices [38], whilst supporting an internationally competitive food industry [39]. Under the system, labels on packaging can display nutrition and health benefits, for example, using statements or claims permitted by the Australia New Zealand Food Standards Code (Food Code) [110]. The Australian Government's voluntary front of package Health Star Rating labelling system (HSR) was launched in 2014 to assist consumers to select healthier foods [111, 112].

Regulating food marketing on product packaging, including the label, is a challenging food policy issue of public health significance [109]. Many food companies make corporate social responsibility commitments, particularly regarding safeguarding children from problems associated with food marketing [346], and provide voluntary nutrition information on food labels in addition to the mandatory nutrition information panel [347]. It is important to understand the application of marketing statements as well as nutrition and health claims by manufacturers of high market-share packaged foods, and their potential impact on food choice. The aim of this study was to objectively evaluate voluntary nutrition and health labelling, claims, and marketing techniques on high market-share UPF in Australia for their potential impact on public health.

4.2.3 Methods

4.2.3.1 Selection of food companies

The global network International Network for Food and Obesity/NCDs Research Monitoring and Action (INFORMAS) aims to monitor, benchmark, and support actions to create healthy food environments, to reduce obesity, non-communicable diseases and their related inequalities [9]. It recommends focussing on the companies with the largest potential to impact on public health nutrition when monitoring the policies and practices of the food industry [164]. Five high market-share manufacturers

of packaged foods in Australia were identified from Nielsen's Top Brands Report 2009, specifically: Allen's, Kellogg's, Nestle, Sanitarium, and Uncle Toby's [311]. Nestle (including the Allen's brand) had the largest share (13.9%) of the chocolate and confectionery market in Australia [348]. Kellogg's (17.8%) had the largest market-share of breakfast cereals in Australia, and Sanitarium (15.4%) and Nestle (including Uncle Toby's) (7.1%) also had a significant share [349]. To explore the emerging trend of supermarket own brands, the widely available Woolworths Supermarkets' Macro range was also included [350].

4.2.3.2 Selection of packaged foods

Breakfast cereals, snacks, and confectionery are among the categories most commonly marketed to children [312, 351]. Foods audited included all the breakfast cereals, snacks, and confectionery items; and selected beverages, condiments, and liquid breakfast meal replacements (referred to as *meal replacements* here on in) available at the time of the study from the food manufacturers. Products were identified from the companies' websites. Labelling information from the 230 packaged foods identified was collected.

4.2.3.3 Data collection

The information for the audit was gathered from the companies' or online shopping websites for Coles and Woolworths, and 'in store' at Coles and Woolworths supermarkets in Cockburn Gateway Shopping Centre in Western Australia, after obtaining permission from the store managers. The following information was collected: product name and brand, processed food group, added sugar and added fat ingredients, nutrition composition; the extent of packaging promotion to children; and nutrition labelling practices and price. Data collection was completed in September 2015.

4.2.3.4 Categorisation of nutrition related information

The extent of food processing for all of the packaged foods was identified, and foods were classified using the NOVA system [67] to analyse the impact of these foods on public health and diet related outcomes. The NOVA system of classifying foods according to the extent of food processing, not nutrient content, aims to address the significance of industrial food processing to public health [67]. The term ultra-

processed foods (UPF) is used to describe nutritionally poor, industrially processed foods that include cosmetic or sensory additives such as colours, flavours, sweeteners, or processing aids; or undergo industrial processes which have no domestic equivalent such as extrusion [67]. The other groups in this classification system are: unprocessed or minimally processed foods, which may be consumed by themselves; processed culinary ingredients, which are used in food preparation; and processed foods, which are relatively simple foods with few ingredients [67].

Free sugars and fats are commonly added to UPF [67], and the Food Code definition of added sugars [315] and a list of commonly used names for sugars [352] were used to guide identification of added sugars.

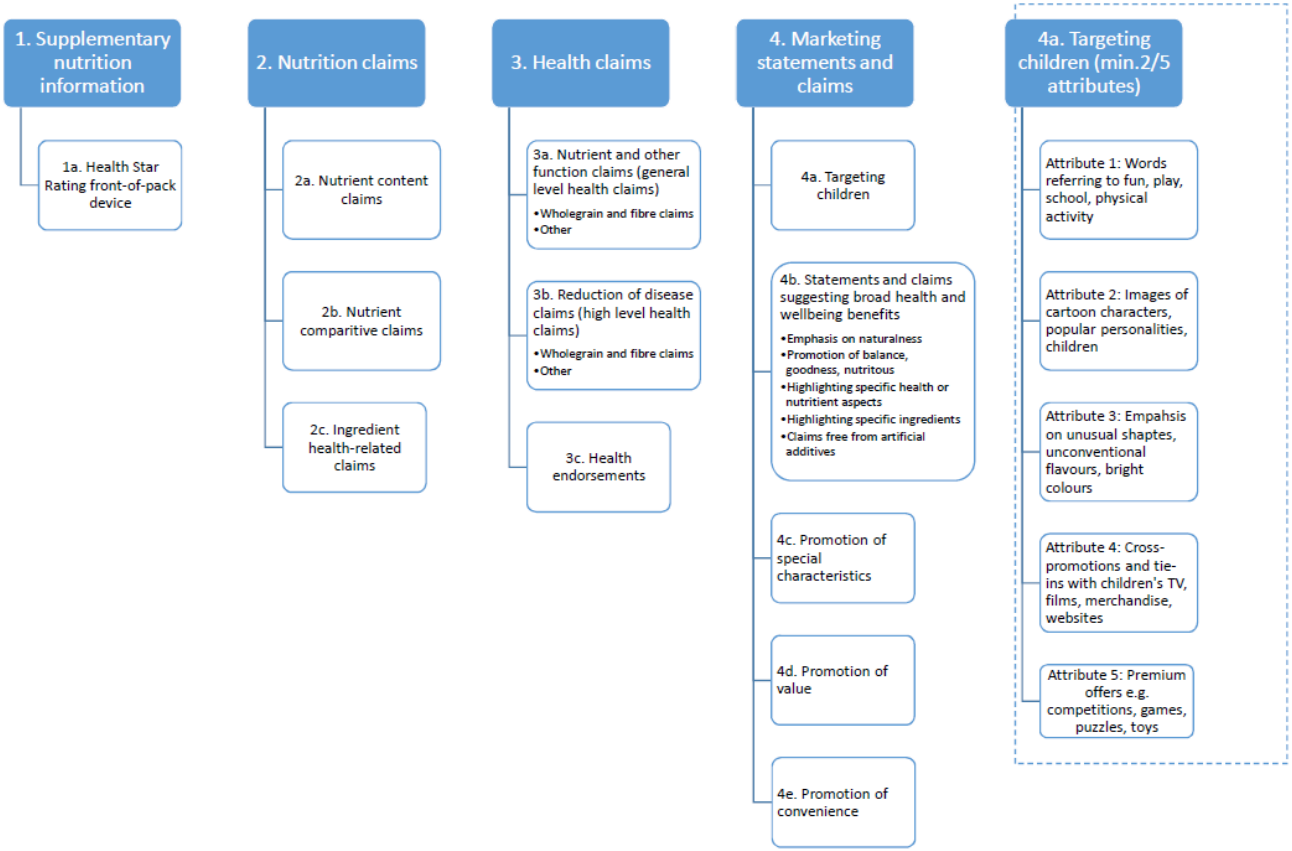
Guidelines for use of the voluntary HSR front of pack labelling device [353] were used to assess the HSR on pack. The HSR algorithm awards points for positive food or nutrient content (dietary fibre, protein, and the proportion of fruit, vegetables, nuts and legumes) and subtracts points for negative nutrients (saturated fat, sodium, total sugars, but not added sugars) then assigns a score from ½ star to 5 stars, with 5 stars indicating the healthiest choice [53] (Figure 4.1). The online calculator provided on the HSR website [353] was used to calculate the HSR for all products, using the nutrition information panel provided on packaging. Few products included fruit, vegetables, nuts and legumes in the ingredients lists, and the calculation was based on content per 100 grams of the following: energy (kilojoules), saturated fat, sugars, sodium, dietary fibre, and protein [53]

Figure 4.1 Health Star Rating front-of-pack labelling device [353]

4.2.3.5 Classification of packaging information

Packaging information was classified using the taxonomy shown in Figure 4.2, based on defined nutrition information and marketing techniques identified by INFORMAS [313] and Mayhew *et al.* [314]. The analysis identified the voluntary components implemented by the food companies that could be influenced by company corporate social responsibility policies. The presence of mandatory nutrition and health related information e.g. nutrition information panels, were collected but not reported as they were present for all products. Products were classified as targeting children using criteria employed by Mehta *et al*. to examine packaging targeting Australian children, which stipulates a minimum of two out of a possible five attributes are present [86] (Figure 4.2).

Figure 4.2 Taxonomy of nutrition and health related packaging information[#]



[#]Adapted from the INFORMAS food labelling taxonomy [313], Mayhew *et al.*'s definitions of marketing techniques promoting health and wellbeing [314]; and Mehta and colleagues' work defining food packaging targeting children [86]

4.2.3.6 Compliance of statements and claims

The Food Code was used to assess legal compliance of food packaging information, using the criteria which are required to be met to make health and nutrition claims. Claims were classified as (i) nutrient content; (ii) nutrient comparative; (iii) ingredient health-related; (iv) general level health; or (v) high level health [110, 315, 316]. Health endorsements administered by organisations such as the Heart Foundation could not be assessed for accuracy, as criteria and product accreditation status were not publicly available. The Australian Competition and Consumer Commission (ACCC) food descriptors guideline to the Trade Practices Act 2006 [354], which defines deceptive and misleading representations about food and beverages, was referred to and mainly related to application of the Food Code for this dataset.

Consideration was given to Clause 10 of the nutrition, health and related claims standard (Standard 1.2.7 [110]) which states that it does not prescribe the words that must be used. Clause 13 of the nutrition, health and related claims standard (Standard 1.2.7 [110]) states that nutrition content claims may be made about a property not listed in the Schedule (Schedule 4 [315]) but the claim can only state that the food does or does not contain this property, that it contains a specified amount, or a combination of these two statements. Claims about the presence or amount of wholegrains were therefore determined to be permitted even though they weren't specifically listed in Schedule 4, and were categorised as ingredient health-related claims for this study. The Grains and Legumes Nutrition Council (GLNC) in Australia have created a voluntary code of practice to encourage promotion of wholegrains on food labels [355]. Therefore, the GLNC criteria were used for assessment of claims against voluntary standards to assess compliance with industry self-regulation.

Data were analysed using the SPSS for Windows statistical software package version 24 (IBM Corp. Released 2016. Armonk, NY: IBM Corp USA).

4.2.4 Results

4.2.4.1 Level of food processing

Most (94%) products were classified as UPF using the NOVA system [67] (Table 4.1). These 215 UPF formed the dataset for analysis.

4.2.4.2 Added sugars and added fats

Most UPF products (95%) contained added sugars (Table 4.1). Fourteen types of sugar were used in the products, with 34 different ingredient names used (e.g. 'sugar' was also listed as 'raw sugar', 'organic raw sugar', 'organic sugar', 'cane sugar', and 'brown sugar'). The overall mean number of ingredient names used for sugar per product was 2.5 (range 0-8). The mean number of ingredient names used for sugar per pack was highest for snack foods at 3.8 (range 0-8). Over half (62%) of products contained added fats, however the mean number of terms used in ingredients lists was only 1 (range 0-3) (Table 4.1).

4.2.4.3 Classification of packaging information

The number of products providing supplementary nutrition information (i.e. HSR), nutrition claims, health claims, and marketing statements or claims are shown in Table 4.1. Overall 55% of products had HSR, 59% had nutrition or health claims, and 97% had selected marketing techniques. On average, each product displayed 1.5 (range 0-10) health or nutrition claims and 2.6 (range 0-5) marketing techniques on the packaging.

The mean number of health stars for all products was 2.97 HSR (range 0.5-5). Breakfast cereals, condiments, and meal replacements had mean HSR of 3.5-5.0 (Table 4.1) and 55% of all products achieved a HSR of 3.5-5.0.

Most (95%) of the products with health or nutrition claims also included marketing statements highlighting broad health benefits. Of these, 87% also featured the HSR; and 82% would be described as healthy (HSR of 3.5-5.0) based on research that determined that foods with these HSR scores were more likely to be consistent with the nutritious core foods recommended by the Australian Guide to Healthy Eating [3, 356, 357].

The most frequent marketing technique used was promotion of 'balance' or 'goodness' (57%), followed by claims of being free from artificial additives (47%), and packaging that targets children (47%). Promotion of value or convenience were the least used marketing techniques.

Most (61%) of the packaging targeting children featured 3 of the 5 identified marketing attributes. Fewer products designed to appeal to children featured the HSR (35%) compared with family orientated products (55%).

4.2.4.4 Validation of statements and claims

Results from validation of the HSR and nutrition and health claims are summarised in Table 4.2. The HSR device was used on 55% of products and the calculation was correct for all products.

Nutrition claims were correct for 18% of products making this type of claim (Table 4.2). Few claims about fibre content complied with criteria specified in the Food Code. The minimum quantity specified in the claims criteria was often not met. Claims about presence of wholegrains were appropriately specified by 73% of products, and substantiated with the wholegrain ingredients identified in ingredients lists. However, the criteria stipulated by industry group GLNC for high or very high source of wholegrains claims were not compliant with the Food Code.

Other nutrient claims were common (44%) with some relating to micronutrient content; 22% of these claims met Food Code criteria (Table 4.2). Unspecific wording was the most common issue, e.g. ‘contains B vitamins’ without giving details of the individual B vitamins.

Only 27% of comparative nutrient claims met Food Code criteria (Table 4.2). Again, wording was not specific enough, e.g. ‘40% less sugar when compared to leading kids snacks’ without specifying the products being compared.

Health claims were present on 25% of products and were correct for 79% (Table 4.2). The most frequent health statement was through a third party endorsement logo such as the Heart Foundation tick (20%). There were much higher levels of compliance for general level and high level claims than for nutrition claims, with most meeting criteria (77% of general level, 100% of high level). Two general level health claims were unable to be assessed as they referred to health benefits for nutrients that were not included on packaging as part of the nutrition information panel.

Table 4.1 Packaging claims and statements present on ultra-processed foods suitable for families from four Australian manufacturers

	Breakfast cereals			Beverages			Condiments			Confectionery			Snacks			Meal replacements			All products		
	n	%	mean	n	%	mean	n	%	mean	n	%	mean	n	%	mean	n	%	mean	n	%	mean
NOVA classification of food processing																					
Group 1 (unprocessed)	8	8.70	-	0	0.00	-	0	0.00	-	0	0.00	-	1	1.72	-	0	0.00	-	**9**	**3.91**	-
Group 2 (processed culinary ingredients)	0	0.00	-	0	0.00	-	2	28.57	-	0	0.00	-	0	0.00	-	0	0.00	-	**2**	**0.87**	-
Group 3 (processed foods)	2	2.17	-	0	0.00	-	0	0.00	-	0	0.00	-	2	3.45	-	0	0.00	-	**4**	**1.74**	-
Group 4 (ultra processed foods)	82	89.13	-	15	100.00	-	5	71.43	-	46	100.00	-	55	94.83	-	12	100.00	-	**215**	**93.48**	-
Proportion of final data set	*82*	*38.14*	-	*15*	*6.98*	-	*5*	*2.33*	-	*46*	*21.40*	-	*55*	*25.58*	-	*12*	*5.58*	-	*215*	*100.00*	-
Products containing added sugar																					
Number of products	78	95.12	-	12	80.00	-	3	60.00	-	46	100.00	-	53	96.36	-	12	100.00	-	**201**	**94.88**	-
Mean sugar content (g)	-	-	19.5	-	-	29.6	-	-	6.8	-	-	51.5	-	-	24.8	-	-	7.1	-	-	**27.4**
Mean number of terms used for added sugar	-	-	2.6	-	-	0.9	-	-	0.6	-	-	1.8	-	-	3.8	-	-	2.3	-	-	**2.5**
Products containing added fat																					
Number of products	31	37.80	-	5	33.33	-	4	80.00	-	30	65.22	-	52	98.11	-	12	100.00	-	**134**	**62.33**	-
Mean fat content (g)	-	-	4.9	-	-	2.8	-	-	42.6	-	-	14.1	-	-	9.7	-	-	1.4	-	-	**8.6**
Mean number of terms used for added fat	-	-	0.4	-	-	0.7	-	-	0.8	-	-	1.1	-	-	1.6	-	-	2.0	-	-	**1.0**
1. Supplementary nutrition information present		-																			
1a. Health Star Rating device present	82	100.00	-	10	66.67	-	5	100.00	-	0	0.00	-	9	16.36	-	12	100.00	-	**118**	**54.88**	
Mean calculated Health Star Rating	-	-	3.9	-	-	3.2	-	-	3.6	-	-	1.2	-	-	2.6	-	-	4.6	-	-	**3.0**
2. Nutrition claims	70	85.37	-	11	73.33	-	5	100.00	-	4	8.70	-	19	34.55	-	12	100.00	-	**121**	**56.28**	-
2a. Nutrient content claims	66	80.49	-	11	73.33	-	5	100.00	-	2	4.35	-	16	29.09	-	12	100.00	-	**112**	**52.09**	-
2b. Comparative nutrient claims	5	6.10	-	5	33.33	-	0	0.00	-	2	4.35	-	3	5.45	-	7	58.33	-	**22**	**10.23**	-
2c. Ingredient health-related claims	47	57.32	-	0	0.00	-	0	0.00	-	0	0.00	-	4	7.27	-	0	0.00	-	**51**	**23.72**	-
3. Health claims	44	53.66	-	1	6.67	-	2	40.00	-	0	0.00	-	4	7.27	-	2	16.67	-	**53**	**24.65**	-
3a. General level health claims	16	19.51	-	1	6.67	-	0	0.00	-	0	0.00	-	0	0.00	-	2	16.67	-	**19**	**8.84**	-
3b. High level health claims	1	1.22	-	0	0.00	-	2	40.00	-	0	0.00	-	0	0.00	-	0	0.00	-	**3**	**1.40**	-
3c. Endorsements	37	45.12	-	0	0.00	-	2	40.00	-	0	0.00	-	4	7.27	-	0	0.00	-	**43**	**20.00**	-
4. Marketing statements or claims	79	96.34	-	14	93.33	-	5	100.00	-	44	95.65	-	55	100.00	-	12	100.00	-	**209**	**97.21**	-
Mean number of marketing attributes present (4a - 4e)	-	-	2.4	-	-	2.1	-	-	3.0	-	-	2.8	-	-	3.1	-	-	2.3	-	-	**2.6**
4a. Packaging designed to appeal to children	25	30.49	-	4	26.67	-	4	80.00	-	28	60.87	-	40	72.73	-	0	0.00	-	**101**	**46.98**	-
Mean number of children's marketing attributes present (max.5)	-	-	1.5	-	-	1.3	-	-	1.8	-	-	2.0	-	-	2.2	-	-	1.0	-	-	**1.8**
4b. Statements suggesting broad health benefits	75	91.46	-	13	86.67	-	5	100.00	-	44	95.65	-	49	89.09	-	12	100.00	-	**198**	**92.09**	-
* Emphasis on naturalness	19	23.17	-	0	0.00	-	0	0.00	-	7	15.22	-	7	12.73	-	0	0.00	-	**33**	**15.35**	-
* Promotion of balance, goodness, nutritious	43	52.44	-	5	33.33	-	0	0.00	-	42	91.30	-	25	45.45	-	7	58.33	-	**122**	**56.74**	-
* Highlighting specific health or nutrient aspects	29	35.37	-	8	53.33	-	3	60.00	-	0	0.00	-	15	27.27	-	12	100.00	-	**67**	**31.16**	-
* Highlighting specific nutrients	30	36.59	-	1	6.67	-	4	80.00	-	0	0.00	-	31	56.36	-	2	16.67	-	**68**	**31.63**	-
* Claims free from artificial additives	26	31.71	-	4	26.67	-	4	80.00	-	32	69.57	-	34	61.82	-	0	0.00	-	**100**	**46.51**	-
4c. Promotion of special characteristics	5	6.10	-	9	60.00	-	0	0.00	-	19	41.30	-	17	30.91	-	0	0.00	-	**50**	**23.26**	-
4d. Promotion of value	1	1.22	-	0	0.00	-	0	0.00	-	0	0.00	-	0	0.00	-	0	0.00	-	**1**	**0.47**	-
4e. Promotion of convenience	15	18.29	-	0	0.00	-	0	0.00	-	1	2.17	-	0	0.00	-	7	58.33	-	**23**	**10.70**	-

Table 4.2 Accuracy of packaging information present on ultra-processed foods suitable for families from four Australian manufacturers

	Number of products making the claim #	Number of products with all claims correct	% of products with all claims correct
1. Supplementary nutrition information			
1a. Health Star Rating device	118	118	100.0%
2. Nutrition claims present	118	21	17.8%
2a. Nutrient content claims	113	21	18.6%
Contains/source/good source of fibre	44	5	11.4%
High/very high/excellent source of fibre	24	3	12.5%
Other nutrient content claim*	95	21	22.1%
2b. Comparative nutrient claims	22	6	27.3%
2c. Ingredient health-related claims	52	38	73.1%
Contains/source/amount of wholegrains	40	38	95.0%
High/good source of wholegrains	7	0	0.0%
Very high/excellent source of wholegrains	5	0	0.0%
Contribution to daily wholegrains target	10	8	80.0%
3. Health claims present	19	15	78.9%
3a. General level health claims	17	13	76.5%
General level claim: fibre or wholegrain	3	3	100.0%
General level claim: other	16	12	75.0%
3b. High level health claims	3	3	100.0%
High level claim: fibre or wholegrain	1	1	100.0%
High level claim: other	2	2	100.0%
3c. Endorsements	43	n/a	n/a

 # Each item of packaging can include multiple classifications of nutrition and health claims

** An additional 16.3% of claims could not be assessed for accuracy as micronutrient content data was not collected*

4.2.5 Discussion

This study identified packaging information present on UPF promoting nutrition and health, and classified it using a taxonomy based on previous work in this area [86, 313, 314]. The presence of added sugars and fats, and ingredients labelling practices were investigated. Use of the HSR, nutrition and health claims, and marketing techniques were also investigated. Prevalence of nutrition and health attributes on packaging specifically targeting children was of particular interest.

4.2.5.1 Use of the taxonomy for classifying nutrition and health statements and claims

The taxonomy of nutrition and health statements and claims adapted for use in this study provided a framework for classifying the information present on high market-share UPF in Australia. The novel aspect of this study is the integration of a food labelling taxonomy from INFORMAS [313], marketing techniques promoting health and wellbeing [314]; and food packaging targeting children [86] to describe the nature and extent of this information.

4.2.5.2 Added sugars and fats

This study identified a high prevalence of added sugars in UPF. This is not surprising, as Australian and US population dietary surveys [358, 359] have found UPF contribute most of the added sugars consumed. An independent review of Australian food labelling recommended that changes are made to the way added fats and added sugars are identified in ingredients lists, to improve transparency.

> *"Where sugars, fats or vegetable oils are added as separate ingredients in a food, the terms 'added sugars' and 'added fats' and/or 'added vegetable oils' be used in the ingredient list as the generic term, followed by a bracketed list (e.g., added sugars (fructose, glucose syrup, honey), added fats (palm oil, milk fat) or added vegetable oils (sunflower oil, palm oil))"* (Recommendation 12, page 9 [276]).

Multiple terms for added sugars were commonly used on packaging, which makes deciphering ingredients lists difficult for consumers. Splitting sugar into component ingredients places them lower in the list of ingredients, obscuring the ranking that it

would otherwise have. Our findings support the recommendation for increased transparency of added sugars on packaging [276]. A separate added sugars line on nutrition information panels, as has recently been introduced in the US [360], should also be considered. Interestingly, despite the recommendation for similar action on added fats [276] this study found that they were more clearly labelled.

The majority of Australian adults and children consume too much added sugar, typically consumed as UPF [361]. Governments [362], public health researchers [363], campaigners [364], and even supermarket chains [365] have called for measures to control or reduce the amount of added sugars present in processed foods. Clearly identifying the amount of added sugar present in UPF is a priority to assist food regulation to protect public health by informing consumers and to underpin health promotion interventions. For example, the LiveLighter© social marketing campaign aims to educate the population about the amount of sugar present in soft drinks [366] and public health advocates are calling for a sugar tax of soft drinks in Australia [367].

4.2.5.3 Classification of packaging information

UPF have been described as hyper-palatable products that are attractively packaged and aggressively marketed, including making use of health statements and claims [67]. This study has demonstrated the accuracy of the definition when applied to a sample of high market-share UPF in Australia. More than half of the UPF packaging in this study featured nutrition or health claims, and almost all of the packaging utilised marketing techniques which related to nutrition and health. In addition, each pack typically displayed multiple claims and marketing techniques demonstrating the extent to which this sort of information is used. Analysis from Canada, the United Kingdom, the US, and Brazil has demonstrated the poor nutritional quality of UPF [368-370] so this high prevalence of nutrition and health related statements and claims on packaging is concerning.

Over half of the products selected for this study featured a HSR on the packaging, although monitoring surveys at the time reported only three percent of products carried a HSR [371]. Breakfast cereal manufacturers adopted the HSR faster than other categories [371], which is not surprising given that Sanitarium, a breakfast cereal manufacturer, and Woolworths Supermarkets were the first public commercial supporters of the scheme [371, 372].

This study demonstrates the complexity of attempting to consolidate different principles for defining and identifying healthy food choices, for example based on nutrient profiling (HSR), food group categorisation (AGTHE), or processing (NOVA). The HSR of most UPF products which featured nutrition or health claims in this study was 3.5-5.0; previous research suggested that foods rated 3.5 stars or above were consistent with the nutritious core foods in the Australian Guide to Healthy Eating (AGTHE) food selection guide [3, 356, 357]. The level of HSR, and the presence of nutrition and health claims on UPF is at odds with their typically poor nutritional quality [368]. Another Australian study found similar anomalies, for example bread or pasta classified as UPF due to their level of processing, are considered nutritious core foods in the AGTHE [77].

A recent review of the relationship between changes in the food system and the global nutrition transition highlights the challenges and importance of describing and categorising foods to measure the health implications of the ongoing changes in the food supply [373]. Poti *et al* (2015) extended the NOVA system by further describing food processing and including 'convenience', dividing UPF into two groups: 'highly processed' ingredients, and 'highly processed' stand-alone foods [73]. Resolution of discrepancies in recommended dietary patterns such as those of the AGTHE, and individual foods recommended by food processing systems such as NOVA, as well as front-of-pack labelling advice including HSR and nutrition and health claims is needed to clarify dietary advice to consumers. Further research to develop an understanding of the effect of multiple nutrition and health claims and statements, combined with the HSR, on consumer food selection is also suggested.

Most products that featured nutrition or health claims also carried messages that were classified as marketing techniques. Marketing techniques designed to make products appealing to potential consumers don't receive the same level of regulatory scrutiny as claims. A wide range of marketing techniques were evident in this study, with most statements suggesting broad health benefits. These marketing techniques were applied to packaging in all categories surveyed, including confectionery and snacks. This is consistent with recent research conducted across sixteen countries which found 87% of all snack food packaging featured claims emphasising general health, wellbeing or naturalness [314]. Unregulated statements that products are 'free from' artificial additives such as colours and flavours, or promote 'balance' or 'goodness' often

mislead consumers into thinking these products are more healthful than they actually are [314], or that their inclusion in a healthy diet is permitted or normal [145]. These are common marketing techniques used by UPF manufacturers to broaden their appeal and make frequent consumption acceptable [67]. Our findings suggest that urgent action is needed to prevent marketing practices that potentially mislead consumers into thinking these unhealthy products are healthy.

This study adds to the existing literature documenting the high level of inappropriate marketing to children present on packaging of UPF in Australia [86]. Most products that were designed to appeal to children featured three of the five marketing attributes previously identified [86]. Voluntary action by the food industry to restrict marketing of food to children was initiated by the Australian Food and Grocery Council in 2008 [374]. However, the Responsible Children's Marketing Initiative [374] focuses on encouraging responsible advertising, and to date has not addressed marketing at the point-of-sale including packaging. The voluntary approach has also not yet proven to be effective in reformulating products targeting children to improve their nutritional quality [209, 212]. Most parents express concern about the level of food marketing to children [106]. Therefore, more public policies are needed to assist parents to identify healthy packaged foods. These policies should address the accuracy and quality of nutritional information provided on UPF.

Given the prevalence of marketing techniques identified in this study, and the challenges in regulating packaging on products targeting children [109], alternative strategies to assist consumers to select healthy packaged foods could be investigated. For example, the supermarket wide Guiding Stars system uses an algorithm to assess both positive and negative nutrient content and has been adopted by five supermarket chains in the US [301]. Guiding Stars aimed to overcome consumers' inability to make sense of the plethora of information present on food packaging by providing a simple guide on the shelf edge tag along with the price [302]. Evaluation shows the Guiding Stars shelf-edge labelling of healthy foods was effective in assisting consumers to purchase more healthy foods overall [51]. Australian public policy to assist consumers to select healthy packaged foods should consider such strategies that can be applied across all UPF available in supermarkets, particularly if voluntary uptake of HSR does not prove effective in assisting consumers to select healthy foods.

4.2.5.4 Validation of statements and claims

This study was unique in that it validated the HSR, and nutrition and health claims present on UPF against the Food Code [110, 315, 316, 347] and other criteria [53, 355]. Findings show that the HSR and high level health claims used were typically accurate. However, there were many issues identified for nutrition claims, and lower levels of accuracy for general level health claims.

Claims on breakfast cereals about dietary fibre or wholegrains content were present on some packaging, however, many were not accurate because the minimum quantity specified in the claims criteria in the Food Code were not met [315]. This finding is surprising, as the packaging included in this study was from high market-share food manufacturers who would be expected to meet the criteria specified in the Food Code. In addition, claims about products being a high or very high source of wholegrains not only failed to follow the Food Code [347], but also failed to adhere to the industry's voluntary code [355]. This indicates the importance of monitoring and surveillance of packaging information applied to UPF, with financial penalties for lack of adherence to regulations and guidelines.

UPF failing to provide accurate nutrition claims on packaging included wording that was not specific enough, typically when products declared the presence of added vitamins and minerals, or made comparisons of nutrient content with other products. However, for the information to be helpful to consumers it needed to include details that weren't provided. These deceptive and misleading practices should be addressed in public policies to provide consumer-friendly nutrition labelling that is easy to understand and addresses public health concerns [375].

4.2.5.5 Limitations

This study has a number of strengths and limitations. Challenges were faced in determining the accuracy of claims for a number of reasons. Clause 10 of the nutrition, health and related claims standard (Standard 1.2.7 [110]) states that it does not prescribe the words that must be used. Therefore assessment of the accuracy of these statements made on packaging was open to interpretation, and other researchers or enforcement authorities may differ in their views.

The findings of this study are likely generalisable to breakfast cereals, snacks, and confectionery in the Australian food supply, and given the globalised supply of multinational UPF, may be applicable to other countries [71]. Only 215 UPF products in five food categories were audited, however it is likely that the same issues apply across other food categories or with other food manufacturers. Therefore, we recommend further research to classify packaging information from a broader range of product categories. Testing the accuracy of nutrition and health claims on a larger sample of products would also assist in identifying the scale of the problems identified in this study. Packaging information including the food industry's Daily Intake Guide thumbnail [376] and micronutrients present in nutrition information panels were not collected in this study. Future research should include this information so that full assessment of supplementary nutrition information (i.e. HSR for this study) and nutrition and health claims can be undertaken.

Strengths of the study include the detailed taxonomy applied to classify packaging information which includes nutrition and health claims, marketing techniques, and classification of products designed to appeal to children, as well as validating these nutrition and health statements and claims.

4.2.6 Conclusions

The taxonomy of nutrition and health statements and claims proved effective in describing the nature and extent of information present on packaging of high market-share UPF in Australia. Based on the findings in this study UPF were typically attractively packaged with labels that incorporated multiple marketing techniques, and extensively utilised nutrition and health statements and claims, despite many products containing added sugars or being rated a less healthy choice. The proportion of inappropriate or inaccurate statements and claims is concerning, particularly on UPF packaging designed to appeal to children. Public policies to assist parents to select healthy packaged foods need to address the accuracy and quality of nutritional information provided on packaged foods, reducing deceptive marketing practices. Recommendations include clearly identifying the amount of added sugar present in UPF by adding a separate added sugars line on nutrition information panels similar to US; conducting further research to ensure the HSR correctly identifies the nutritional quality of UPF; conducting further research to build the evidence for the role of level

of food processing in selection of healthy dietary patterns; resolving discrepancies in recommended dietary patterns (e.g. AGTHE) and individual foods recommended by different systems such as NOVA, and front-of-pack labelling advice e.g. HSR; and consider wider application of a modified HSR across all food products to more accurately advise consumers on how to select foods for a healthy dietary pattern. Monitoring and surveillance of compliance of packaging information applied to UPF with current regulations is also important.

4.3 Publication #5: Who should help customers to select healthy foods in supermarkets? A qualitative study of Australian parental views [1]

4.3.1 Abstract

Background: Marketing activities contribute to shaping food environments, which have a substantial impact on food selection and diet. Marketing of unhealthy food to children is excessive in Australia, with products widely available and prominently displayed in supermarkets. Regulatory responses can alter food environments and are effective, rapid, and equitable. Yet, consistent with a neoliberal political agenda, the Australian government focuses on industry self-regulation and information provision, including the voluntary Health Star Rating interpretive front-of-pack labelling system (HSR). Food companies frame such voluntary measures as corporate social responsibility (CSR) initiatives to ensure consumer welfare. This research aimed to provide a lived experience of the impact of CSR on parents' ability to select healthy foods in the supermarket.

Methods: Five 90-minute focus groups were conducted by an experienced facilitator in Perth, Western Australia. Thirty-seven parents of children aged 2 and 8 years participated: four fathers and 33 mothers aged 25 to 48 years. Groups were audio-recorded and transcribed verbatim and inductive thematic content analysis conducted.

Results: Seven themes arose: (1) pressure of meeting multiple demands; (2) desire to speed up shopping; (3) feeding them well versus keeping them happy; (4) lack of certainty in packaging information; (5) government is trusted and should take charge; (6) food manufacturers' health messages are not trusted; and (7) supermarkets should assist parents to select healthy foods. Parents described how shopping with young children in supermarkets was stressful and limited their ability to select healthy foods. Making healthy choices was just one of a multiplicity of criteria that parents weighed up when shopping.

[1] This is the submitted version of the following article: Pulker CE, Chew Ching Li D, Scott JA, Pollard CM. The impact of voluntary policies on parents' ability to select healthy foods in supermarkets: A qualitative study of Australian parental views. *Int J Env Res Pub He*. 2019; 16: 3377 which has been published in final form at https://doi.org/10.3390/ijerph16183377

Conclusions: Food packaging information appears to be contributing to parents' uncertainty regarding healthy food choices, suggesting an information overload. Although they trusted government health messages they did not use the HSR and were unaware that it was a government-led initiative. They were sceptical of food manufacturers' health messages. Supermarkets could respond to parents' trust in them by taking a structural approach to CSR, providing shopping environments that support and encourage healthy food choices.

4.3.2 Background

Powerful food companies have been identified as drivers of obesity and diet-related non-communicable diseases [145]. Poor diet is one of the most important risk factors for early deaths globally [2]. In Australia, supermarkets act as primary gatekeepers of the food system [322], and there is a high level of foreign ownership of food brands by large global manufacturers [143]. Food manufacturers' products and marketing activities contribute to shaping food environments [164], which have a substantial impact on food selection and diet [9]. Although supermarkets sell healthy food, in Australia less than half of commonly available supermarket packaged foods were classified as healthy [16]. Unhealthy snack foods such as crisps and confectionery are displayed at prominent supermarket locations such as the ends-of-aisles and checkouts [14].

Excessive marketing of unhealthy food presents a major threat to public health, particularly for children [377]. Packaging, a key marketing method, is the primary means of communicating information to consumers about product attributes at the point-of-purchase [103]. A large proportion of supermarket purchases are made on impulse, and packaging plays a crucial role in purchasing decisions [86]. Packaged foods designed to appeal to children are widely available and displayed in prominent supermarket locations [17]. Sixteen marketing techniques have been used on packaging to appeal to children including cartoons and celebrities, and most products marketed to children via packaging are unhealthy [86]. Excessive marketing of these nutrient-poor 'discretionary foods', or 'fun foods' [104], to children encourages overconsumption [105] and few Australian children consume diets consistent with Australian Dietary Guideline recommendations [69]. Australian parents are concerned about food marketing to children [106] and believe it influences their children's food preferences [107].

Policies that address the information provided on food packaging are needed to assist parents to select healthy foods [108].

Government responses to food marketing targeting children have been driven by the dominant neoliberal political agenda in many countries, whereby policy is minimized to promote global trade [40]. Voluntary measures and self-regulation strategies require the least government intervention [149]. The Australian government's focus is on voluntary initiatives to assist consumers to make healthier food choices, including the Health Star Rating front-of-package interpretive labelling system (HSR) which was launched in 2014 [112]. Public health responses often focus on providing information and education to assist individuals to select healthy foods [152] however, policy and regulations can alter population environments [153] and tend to be more effective, rapid, and equitable [152]. There is a lack of research examining consumer use of front-of-pack nutrition labelling in real world settings [378].

Food companies, including manufacturers and retailers, have the collective power to assist consumers to select healthy foods [55]. Voluntary measures are framed by food companies as socially responsible initiatives designed to ensure consumer welfare [44], referred to as corporate social responsibility (CSR) [58]. CSR has been criticized as a mechanism to differentiate products and appeal to consumers [379], pass responsibility from food companies to consumers [45], and prevent regulation [46]. Although consumers may not be aware of CSR initiatives, they select food in supermarket environments which are impacted by food companies' efforts to act responsibly.

A review of publicly available Australian food companies' CSR found many did not have policies on marketing food to children and, where present, restrictions were not strong enough to be effective [55]. CSR strategies have been used to build brand reputation, appeal to parents and children through community activities, and align with respected organisations [300], which was valued by parents and children [380].

High-market-share Australian food companies have made CSR statements about the importance of health and nutrition (see Table 4.3 for examples). However, the ability of CSR statements and actions to support consumers to select healthy foods has not been investigated. To date, no study has specifically explored how the dominant neoliberal political context, which favors information-based voluntary measures and CSR, influences parents' food selection. It is not known who parents believe should

be responsible for providing the information they need to select healthy foods, or the relative value they place on information provided by food manufacturers, supermarkets or government. Parents' use and understanding of HSR and other nutrition messages in real world settings can inform policy recommendations for minimizing harm from inappropriate food marketing to children.

Table 4.3 Corporate social responsibility commitments of selected high-market-share Australian food companies

Food company	Importance of nutrition and health
Nestle [381]	Nestle's ten principles of business operations places nutrition health and wellness first. *"Our core aim is to enhance the quality of consumers' lives every day, everywhere by offering tastier and healthier food and beverage choices and encouraging a healthy lifestyle. We express this via our corporate proposition Good Food, Good Life."*
Kellogg's [382]	Kellogg's seeks to nourish families so that they can flourish and thrive. *"We believe nutrition literacy is crucial in helping consumers make informed food choices for themselves and their families. Through on-pack labeling and website content, we provide comprehensive nutrition and ingredient information, including details on calories, fiber, fats, sugar and other nutrients, for all of our foods."*
Sanitarium [383]	Sanitarium's promise to consumers: *"One of Sanitarium's core philosophies is truly nourishing food, and each Sanitarium product is designed to meet our high nutritional and food appeal standards. We invest significantly in providing the community with free nutritional information and advice through our team of qualified nutritionists."*
Woolworths [384]	Woolworths' corporate responsibility information does not include commitments on health and nutrition. However, when announcing their partnership with Jamie Oliver [385], they stated: *"The partnership will focus on bringing better, healthier, affordable fresh food to life for everyday Australians, giving them the information and confidence to prepare great tasting fresh meals at home."*

Footnote: The cited reports were current at the time of conducting the focus group discussions.

This exploratory study aimed to describe the lived experience of the impact of CSR on parents' ability to select healthy foods in the supermarket. Due to the business nature of CSR, the specific research questions did not refer to the concept directly. They were: (1) Are parents able to navigate marketing techniques used on packaging to select healthy foods for their children? (2) Who do parents believe should be responsible for giving them the information they need to make healthy food choices for their children? (3) What role do parents believe food companies should take in helping them select healthy foods for their children?

4.3.3 Methods

The exploratory nature of this research required a qualitative approach to encourage open-ended in-depth inquiry of the topic [317]. Focus groups were chosen to allow participants to talk to each other as well as the facilitator, which is a useful way of exploring knowledge and experience [318]. The consolidated criteria for reporting qualitative research (COREQ) were used to describe the methods for this study [386] (Table App 7.6). The Curtin University Human Research Ethics Committee approved the research study (RDHS-186-15).

4.3.3.1 Participants and recruitment

Parents of young children (2-8 years) were recruited from a market research panel of adults who had expressed interest in contributing to research. Parents with children of this age were the focus of the study given their influence on young children's food choices and preferences. Purposive sampling was used to recruit participants from both high and low socio-economic status (SES) areas [319]. Potential participants were contacted by a market research company by telephone if they met the screening criteria (main household food shopper; had children aged 2-8 years; no immediate family working for a food manufacturer or in market research, advertising, or nutrition) and invited to attend a focus group. Participants were given AUD$80 as compensation for their time and travel costs.

Participants (n=37) comprised of four fathers and 33 mothers aged 25-48 years, most of Caucasian descent. Most participants from the first, second and fifth groups lived in high SES areas, and those in the third and fourth groups lived in lower SES areas (Table 4.4).

Table 4.4 Focus group sample characteristics

Sample characteristics	Total
	n=37
Gender	
Male	4
Female	33
Age group	
18–25 years	2
26–35 years	13
36–50 years	22
Socioeconomic status	
Low	14
Medium to high	23
Age of youngest child	
Preschool (2-4 years)	23
School age (5-8 years)	14
Gender of youngest child	
Male	21
Female	16
Number of children	
1	9
2	21
3	6
>3	1
Highest level of education	
Year 12	5
Trade/diploma or TAFE course	15
University Bachelor degree of higher	17
Marital status	
Married	27
Defacto	8
Divorced/ separated/widowed	2
Employment status	
Self-employed	5
Employed part-time	13
Employed full-time	5
Home duties	11
Student	1

4.3.3.2 Design and procedure

Five 90-minute focus groups were conducted in 2015. On arrival, researchers gave participants an information sheet stating the purpose, risk and benefits of the study, informed them that the focus group would be recorded and they would be de-identified during transcription to ensure all data were anonymous. Written consent for the recording to take place was obtained. Demographic data were collected using a written survey prior to the groups commencing. Focus groups were conducted at a market research company, in a conference room with a large table and chairs and light refreshments were provided. An experienced qualitative researcher employed by a market research company facilitated the focus groups. Two researchers were present in a room adjacent to the conference room and observed the focus group discussions via a two-way mirror.

4.3.3.3 Selection of visual stimuli

Use of visual stimuli to encourage discussion between focus group participants has been shown to be effective [320]. Twenty five packaged foods were introduced to stimulate discussion (Figure App 7.2). Products were selected from high-market share food manufacturers to increase the likelihood of familiarity. They were chosen to show a variety of marketing techniques commonly used by manufacturers to appeal to children, including cartoon characters, playful shapes, bright colours and health statements and claims. Some products featured HSR with a range of scores. Each of the selected high-market share food manufacturers made CSR statements about the importance of nutrition and health (Table 4.3). Fresh apples and bananas acted as benchmarks for healthy foods.

4.3.3.4 Development of focus group guide

A semi-structured guide directed focus group discussions whilst allowing for diversions reflective of participants' statements (Table 4.5). The concept of CSR was considered too abstract to address directly in the focus groups. Therefore the guide was designed to prompt discussion about the way food packaging might influence participants when shopping, and the relative value they placed on information provided by food manufacturers, supermarkets and government. The guide had seven questions, starting with an icebreaker to encourage free expression of the difficulties of feeding

young children that prompted participants to introduce themselves and their families and rate each family member's food fussiness.

Table 4.5 Questions used to promote focus group discussion#

1. Introductions and icebreaker.
    - Lead the introductions, providing an opportunity for the participants to meet each other and feel more comfortable about joining in the group discussion.
2. Looking at some examples of foods from the supermarket, do you recognise any of them?
3. Thinking about shopping in your regular supermarket, what information do you use to decide if foods meet you or your children's needs?
    - If health isn't brought up by participants, return to this question after asking Q4 and ask: Where do you get the information you need to decide if the foods are healthy?
4. Who is responsible for providing that information?
    - Do food companies or supermarkets have any responsibility?
    - If health isn't brought up by participants, return to this question and ask: Who is responsible for providing you with the information you need when shopping, to decide if foods are healthy? How do you think they are doing?
5. Is there anything you really like about the information food companies put on food packaging?
    - Is there anything you really don't like?
6. Returning to the examples of foods from the supermarket, can you sort these foods into groups of similar products?
    - Ask the group to sort the products without giving them any criteria, to explore how they categorise the foods.
    - If health isn't used as the main sorting characteristic, ask the group to sort the foods again, this time based on perceived healthiness, and talk about the reasons why they put them into the selected category.
7. In your opinion, is there anything that food companies or supermarkets should be doing to help you choose healthy foods for your children?

 # The order of the questions could vary, reflective of each focus group

To address the first research question, participants were asked to work together as a group to sort the 25 products into groups of similar products, to understand how they categorised foods, used packaging information to make decisions, and whether there was general agreement on criteria (if used). It was anticipated that the product sorting exercise would identify decision-informing criteria related to price, child-orientation,

appetite appeal, acceptability, and/or health. If health was not chosen, the facilitator later prompted the group to sort the products again according to perceived healthiness.

The facilitator then asked a number of questions to address the second research question. Participants were prompted to think about the information they use to decide whether products were healthy or not, who they think is responsible for providing information on packaged foods, and whether government, food manufacturers or supermarkets should be responsible for helping parents choose healthier foods.

To address the third research question, participants were asked what food manufacturers and supermarkets could do to assist them to select healthy food. During the product sorting exercise they were prompted to discuss their views on the information provided on food packaging and whether or not it was helpful in making healthy choices.

4.3.3.5 Data analysis

Data were analysed concurrently with focus group data collection to determine when saturation was reached [386]. Audiotapes were transcribed verbatim by a professional transcription service, and data entered into NVivo11 and reviewed line by line for concepts. Inductive content analysis of the transcripts was conducted by two researchers concurrently which allowed patterns and themes to surface. The process included initial familiarization with the transcripts, followed by open coding of text segments that addressed the study objectives, and creating themes. Review of the segments continued until overlap among the themes was reduced, and main themes identified [321]. When general consistency in the themes was achieved, the most important themes or categories was agreed among all of the research team.

4.3.3.6 Theoretical framework

The implications for CSR are discussed applying a *political* (i.e. large companies accept responsibility for their impact on society via corporate citizenship) and *ethical* (i.e. companies accept social responsibilities as an ethical obligation) lens to analysis of findings [59].

4.3.4 Results

Seven themes arising from the analysis were grouped into two broad categories. Firstly, themes relating to parents' ability to select healthy foods: (1) pressure of meeting multiple demands; (2) desire to speed up shopping; (3) feeding them well versus keeping them happy; and (4) lack of certainty in packaging information. Secondly, CSR themes relating to who participants thought should be responsible for assisting parents to select healthy foods: (5) government is trusted and should take charge; (6) food manufacturers' health messages are not trusted; and (7) supermarkets should assist parents to select healthy foods. Each theme is explored below.

4.3.4.1 Pressure of meeting multiple demands

Participants described how they attempted to meet all of the different food tastes and preferences of their family, and avoid wasting food, while trying to ensure their children ate a varied diet. This could involve preparing multiple versions of a meal, or preparing food in advance and freezing it.

> "We'll do spag bol (sic), it'll have vegetables that are big enough that you can take them out for one kid and then noodles, probably have noodles because my daughter only wants noodles, and then I'll have no pasta and I'll just have it with broccoli" (group 4 participant)

Selecting school lunchbox food required careful consideration. Participants described the rules set by schools for permitted lunchbox foods, as well as practical considerations such as food remaining safe until lunchtime, and fostering independent eating for younger children.

> "They are not going to take a meal to have on a plate, its stuff that's got to be in their lunchbox and it's got to survive" (group 3 participant)

Overall, eating healthily was considered laborious and time-consuming. Reading nutrition labels while shopping with children, and preparing and cooking healthy meals, were difficult to incorporate into busy schedules.

> "You have to be organised I think, if you want to eat healthy you've got to be prepared and organised and know exactly what you're going to have" (group 5 participant)

4.3.4.2 Desire to speed up shopping

Parents of younger children emphasised the desire to get in and out of the supermarket as fast as possible, leaving little time to scrutinise food labels. They described a lack of certainty in the information available on food packaging. To speed up the shopping process participants developed their own criteria to determine whether foods were appropriate, including: avoiding foods with colours, flavours, preservatives; avoiding sugary foods; or avoiding specific areas of the supermarket such as the confectionery aisle. Some participants compared labelling information to a perceived 'bad food' as a benchmark, or used cues from the packaging information and design features.

> "Colours do make a difference because if I saw something like that Rice Bubble thing multi-colours, rainbows, I would think it's full of sugar" (group 1 participant)

They assumed that products designed to appeal to children, with colorful packaging or licensed characters, were unhealthy choices.

> "When you have pictures of princesses or you know they try to attract kids, it's not healthy for the kids" (group 4 participant)

Despite discussion about HSR in each of the groups, and its presence on half of the packaging stimuli, participants failed to see HSR as a means to speed up shopping. Instead they deferred to the more familiar traffic light system used in school canteens.

> "I'd love Australia to have the traffic light system of rating. I think some countries have it, it's mandatory to have it on all the boxes and it basically rates the food as to how healthy it is" (group 1 participant)

4.3.4.3 Feeding them well versus keeping them happy

Participants allowed their children to eat some unhealthy foods or meals, provided they ate more healthy foods or meals on balance.

> "I know they're eating wholegrain bread for lunch and they're going to be having chicken and veggies (sic) for dinner, so I can make a decision to give them something high in sugar" (group 2 participant)

Some participants allowed their children to eat 'junk' occasionally as they ate healthily for the rest of the week. They described the balance between ensuring their children ate well, and making compromises to meet the challenges of everyday life.

> "Sometimes I'm busy and I might have nuggets in the freezer so we'll chuck them in the deep fryer" (group 5 participant)

Participants expressed a need to exert control over foods their children ate. They used quite forceful language to express the importance of making responsible decisions. However, they openly described how their children regularly influenced their food purchase decisions.

> "I mean I dictate a fair bit about what I buy, and I have been made to buy Dora [the explorer, cartoon character] baked beans over normal ones" (group 5 participant)

Participants described the balance they need to make between allowing their children to exert influence over food selection and the need to enforce some rules about appropriate foods.

> "It's easier to go with the flow, but in the end it's harder and they really should be doing what you say" (group 2 participant)

4.3.4.4 Lack of certainty in packaging information

Participants' responses indicated they lacked certainty in information about diet and health coming from many sources. The fundamental question of what constituted a healthy diet was discussed by some participants who were unsure what to look for on packaging.

> "Are we defining healthy as sugar, fat, salt? Or are we defining healthy as chemicals, additives, preservatives?" (group 5 participant)

They acknowledged that information was available to assist them, provided they knew how to read it. They stated a lot of people don't know how to read the nutrition information present on food packaging, which required consumer education to understand. Even if able to understand packaging information, the time needed to make informed food selection was not practical for most participants. Some

participants therefore simplified the process by looking for specific information. Others accepted packaging information and claims without question.

> "If they say it's good for me I'll think it is, I don't like to put too much thought into it because it really confuses me" (group 2 participant)

HSR was discussed as an option that could facilitate removal of unnecessary information on packaging. Participants agreed that one simple indicator would assist them to select healthy foods, provided the other information was removed.

> "I think the stars is better than all that writing, a quick summary" (group 1 participant)

Participants said that supermarkets would resist assisting them to select healthy foods, arguing that information was already clearly displayed. However, navigating information in the supermarket environment is something participants do want help with.

> "It is very, very tricky, very tricky, that's why you've just got to keep it simple" (group 5 participant)

4.3.4.5 Government is trusted and should take charge

When discussing personal responsibility for making healthy food choices, participants stated it was difficult to make good decisions without information from a trusted source, such as government. There were no complaints of the 'nanny-state' telling parents what to do. Some protested that government should do more to assist parents to select healthy foods, whilst others did not believe government was empowered to do any more.

> "The government should be doing more about the labelling so that it's clear and concise instead of putting pressure on the parents to put healthy stuff in the lunchbox. It should be the parent's responsibility to eat healthily at home, it should be the government's responsibility to protect people's inundation with misleading information" (group 3 participant)

Participants believed that government should assist them to make healthy food choices by telling manufacturers what information to display on packaging. Government's

role was to establish labelling requirements that show the healthiness of foods, and monitor food companies' compliance with the guidelines.

Participants believed labels would only be accurate and helpful with government leadership. They were concerned that food manufacturers would be selective with labelling information unless government mandated what should be included. The level of implied trust in government was remarkable. For example, there was some awareness of HSR but trust in the scheme increased as they discovered government's role.

> "They should say to the mothers out there that this is the system that we are now using like the Australian-made logo and just letting us know what it actually means, it's a great idea" (group 1 participant)

The question of whether the voluntary HSR system would assist them to make healthier food choices was discussed by several groups. The view that government needed to make HSR mandatory to be effective was expressed repeatedly.

> "I don't think we should have voluntary things which you know the only people who volunteer to be part of it are the ones who know they're going to get a good rating" (group 4 participant)

4.3.4.6 Food manufacturers' health messages are not trusted

Participants tended to purchase a repertoire of brands however they didn't believe this to be due to brand loyalty, rather their preference for the products. They described a general lack of trust in food manufacturers to assist them to select healthy foods, due to the profit-driven nature of food manufacturing.

> "I don't trust a lot of the labelling, I feel like a lot of the labelling is marketing" (group 5 participant)

Participants expressed frustration at the lack of transparency on food labels and had difficulty understanding health-related packaging information. Some believed that food manufacturers omitted important information and gave examples of ways packaging information was misleading or deceptive, such as using percent daily intake values for adults on packaging targeting children.

> "My concern is that when they say this is 5% of your daily intake, it's based on an adult male average diet, and these foods are aimed at children" (group 3 participant)

They challenged serving sizes which weren't considered to reflect the amount people usually eat and the use of selected nutrient claims that failed to reflect overall nutritional quality.

> "100 grams is less than a cup and you'd give your child more than a cup worth of cereal" (group 3 participant)

There was acceptance that food manufacturers are commercial enterprises, and that packaging was mainly used for marketing purposes. Participants believed manufacturers would not act responsibly of their own accord and did not trust them to determine what constitutes healthy food. They agreed food manufacturers should follow government guidelines, and provide transparent information to consumers.

4.3.4.7 Supermarkets should assist parents to select healthy foods

Many participants described shopping with their children as stressful due to practical considerations of caring for and managing young children, as well as managing responses to children's demands for foods they found appealing.

> "All three of the kids have a little basket and they continually run into old people, and I fill them up, and then they argue over who gets to carry what, and I try not to shout at everyone" (group 5 participant)

Participants used a number of strategies to select healthy food, including selecting products they were already familiar with. Whilst supermarkets were not held responsible for the nutritional quality of foods sold, participants viewed them as service providers and expected high standards. Participants said supermarkets should make it easier to find healthy foods.

> "They are so big now that they should be able to, if they want us to come and trust their shops then why can't they?" (group 1 participant)

They suggested ways supermarkets could assist them to select healthy foods, including having specific locations for displaying healthy choices or introducing shelf-labelling to identify healthy products.

> "The supermarket could so easily just hang a little tag next to it, a little green light, and explain what falls into those categories so you can go and make a decision about it, well it's just an easier shopping decision isn't it?" (group 4 participant)

Some participants said supermarkets had taken advantage of consumer demand for healthy food by charging more. Overall, they didn't believe supermarkets would introduce measures to assist them for commercial reasons.

> "Woolies and Coles [supermarket chains] are there to have everything in the one place for you and I'd love it if they made things really easy and they helped but in a consumer money driven world it's unlikely" (group 3 participant)

They anticipated supermarkets would argue that provision of product information, alongside selling healthy foods such as fresh produce, was sufficient to assist consumers to select healthy foods.

There were some additional frustrations from online shoppers about supermarkets' websites. The absence of ingredients lists and nutrition information made it impossible for participants to make healthy choices.

> "I get very frustrated because I will see something on special and you can't go in to see the ingredients, oh well even if it's a really good price I won't put it in my shopping cart" (group 3 participant)

Participants stated that supermarkets had a responsibility to provide good service to their customers, which included assisting them to select healthy foods.

> "I think anyone who is providing a service does have a responsibility to their customers to provide the very best service that they can" (group 3 participant)

4.3.5 Discussion

This exploratory study provides a lived experience of the impact of CSR on parents' ability to select healthy foods in the supermarket. The challenges faced when selecting healthy foods were described, and the concept of CSR was explored as parents described how government, food manufacturers and supermarkets should assist them. A political and ethical CSR lens is applied to analysis, whereby large companies accept responsibility for their impact on society as an ethical obligation. The study shows how the dominant neoliberal political agenda, which favors information-based voluntary measures and CSR, restricts consumers' ability to select healthy foods.

Participants described shopping in supermarkets with young children as stressful and limiting their ability to select healthy foods. These findings are consistent with American research which found parents rarely had enough time to evaluate products in order to make healthy choices [103]; and a New Zealand study which found labelling information had little influence on parents' food choice due to competing demands [387].

Multiple demands required participants to select food their families would eat and schools would permit in lunch boxes, and provide a healthy diet, on a budget. They described the balancing act between allowing their children to exert influence over food selection and the need to select appropriate healthy foods. In short, making healthy food choices were just one of a multiplicity of criteria they considered.

The lack of certainty in packaging information experienced by participants also limited their ability to select healthy foods. It is likely that this is due to 'information overload' which occurs when the amount of information available becomes more of a hindrance than a help [388]. Consumers respond to information overload on packaged products by using a limited number of attributes [389], which was evident as participants described making judgements using their own criteria or structural cues such as avoiding the confectionery aisle.

The Australian government-led HSR aims to assist consumers by providing a single, consistent, accurate, front-of-pack labelling system [276]. Products are scored from ½ to 5 health stars (the healthiest choice), based on an algorithm that allocates points for positive components and subtracts them for negative nutrients [53]. Participants had low awareness and understanding of HSR, which was not surprising as only a thousand

packaged foods carried the rating at the time of the research, 15 months after implementation [390]. Findings suggest that for consumer trust in HSR to be achieved there needs to be greater transparency regarding who is responsible and the nutrition criteria applied, consistency with more established schemes (e.g. school canteen traffic lights), and familiarity which can be built over time [391]. The HSR, and similar schemes, would have greater impact as part of a broader range of policies designed to create healthy food environments [391].

Government was trusted by this study's participants, who thought they should take more responsibility. They expected government to set the rules for health statements and claims that food manufacturers could then use on packaging, and monitor compliance. Participants believed government should set the criteria used to define healthy foods, not food companies. Trust in HSR increased when participants discovered the scheme was government-led. These findings suggest parents do not support the dominant neoliberal political agenda of information-based voluntary measures and CSR, and would support a regulatory approach. This is consistent with a government survey of Western Australian adults which found that 97 percent believed regulating nutrition information on food labels was important [392]. South Australian consumers also held government responsible for food labels, however, in contrast to this study's findings, they distrusted government's ability to act responsibly [393]. The Australia New Zealand Food Code sets criteria that are required to be met for health and nutrition claims [315] but marketing statements and claims which are more prevalent are not subject to the same level of scrutiny [108]. Government regulation of marketing statements and claims on food packaging is considered a more difficult policy area than advertising, although potentially more effective if it can be resolved [109].

Food manufacturers' voluntary CSR efforts to assist consumers to select healthy food were not trusted by participants, nor did they trust them to determine what constituted healthy foods. In fact, they said oversight by government was needed. From an ethical perspective, participants believed voluntary action by food manufacturers was influenced by commercial interests, which is consistent with South Australian research [393]. Similarly, European consumers were mistrustful of nutrition claims on food products and required more information before making a choice [394].

Participants assumed food manufacturers would be unwilling to voluntarily highlight unhealthy foods. For example, they would only apply HSR to products that achieve a good rating. This is concerning as it supports the 'health halo' theory which asserts that the presence of a health message implies the food is healthier than it actually is [395]. This study's findings indicate CSR efforts from food manufacturers were not effective in assisting parents to select healthy foods, mainly because they were not trusted.

Supermarkets' CSR actions were more trusted than food manufacturers by this study's participants. Despite describing a definite role for government in setting rules for food manufacturers, the need for government to monitor supermarket activities was not discussed. Supermarkets' failings were expressed as frustrations rather than examples of deception, including failure to display product information for online shoppers, which is a gap in current food regulations [396, 397]. Supermarkets have been described as trusted food authorities due to long associations with experts such as the Dietitians Association of Australia, as well as celebrity chefs such as Jamie Oliver and Curtin Stone [252]. The public health impact of supermarkets has been overlooked by governments [282], who seek their presence during policy making.

Participants proposed ways supermarkets could implement CSR to assist parents to select healthy foods. Suggestions included introducing shelf-labelling to identify healthy products, and supermarkets' dedicated health food aisles were referred to as a location for healthy choices. These suggestions indicate supermarkets need to take a broader structural approach to assist parents to select healthy food, not just food labelling. Australian supermarkets' so called health food aisles currently sell processed packaged gluten-free, vegetarian, and organic foods, as well as whole foods including nuts and grains, with no indication of criteria used to designate health status [398, 399]. Redesigning the way products are displayed in supermarkets, and increasing the availability of healthy foods by allocating more shelf-space have been identified as important [375]. However, participants believed supermarkets would not take action for commercial reasons.

Previous CSR research has concluded that Australian supermarkets are less active than food manufacturers and food service operators in specifying and implementing CSR initiatives to assist customers to select healthy foods [55], which presents an opportunity

for Australian supermarkets. In Britain, Tesco and Sainsbury aim to improve the nutritional quality of their supermarket own brand foods [48, 49]. Other CSR approaches include: restricting multi-buy promotions that encourage bulk purchase of unhealthy foods [304]; removing lunchbox sized sugar sweetened drinks from sale [337]; introducing a supermarket-wide shelf-edge labelling system that identifies healthy foods [301]; and introducing personalised shopper profiles that track the amount of healthy foods purchased [305]. Supermarkets' ability to implement CSR to assist parents to select healthy foods deserves further examination.

There are strengths and limitations to this study. The focus groups provided insight into participants' use and understanding of packaging information, and who they held responsible for providing it. The questions were asked to explore consumers' indirect impressions of CSR as there appears to be little direct awareness of CSR. Further research into the ability of CSR statements and actions to support consumers to select healthy foods is recommended. Findings cannot be generalised to the broader population, or supermarket shopping where there is less time to consider packaging information. The high market-share products used as stimuli may not normally be purchased by the participants. The views of food system actors discussed by participants (i.e. food manufacturers, government, supermarkets) were not considered, and future research examining their perspectives would add to the literature.

4.3.5.1 Implications for public health policy and practice

The findings from this study indicate that the current Australian policy response to food marketing to children, which favors information-based voluntary measures and CSR, does not assist parents to select healthy foods. The government-led voluntary HSR is one of only two national policy actions, the other being the Healthy Food Partnership [299], a public-private-partnership which aims to improve the nutritional health of all Australians [295]. Former Australian food policy interventions have failed to deliver integrated food policy (the National Food Plan [400]), or proved to be inefficient and unsustainable (the Australian Food and Health Dialogue [401]). Providing information and placing responsibility on individuals is common government policy in other countries [402], but regulatory approaches are more effective [152].

A number of government-led policy actions are suggested as a result of this study, including: consider the public health impact of supermarkets' business practices;

develop initiatives that go beyond provision of nutrition information to include other aspects of food environments (i.e. food availability, price, promotion, and placement); require online food retailers to display product information; restrict marketing techniques on packaging of poor nutritional quality foods; communicate existing guidance on healthy eating and food selection.

A structural approach for CSR action in supermarkets is recommended as they appear to be trusted and have the power to assist parents to select healthy foods [322]. Supermarkets that accept responsibility for their impact on society as an ethical obligation can assist parents to select healthy foods by: applying appropriate health criteria for foods sold in health food aisles; placing healthy foods in prominent locations; introducing shelf-edge labels to identify healthy choices; and providing product information for online shoppers.

4.3.6 Conclusions

The dominant neoliberal political context, which favors information-based voluntary measures and CSR, impacts consumers' ability to select healthy foods in real world settings. Parents consider a multiplicity of criteria when selecting food, and struggle to navigate food packaging marketing techniques. Government should take action to build trust in the HSR, restrict marketing techniques present on the packaging of poor nutritional quality foods, and communicate existing dietary guidance on healthy eating and food selection. Food manufacturers should demonstrate ethical CSR for their impact on society by providing transparent packaging information. Supermarkets should take a structural approach to CSR initiatives assisting parents to select healthy foods. Current supermarket action deserves scrutiny, as they appear to have established some trust with consumers

4.4 Summary of the chapter

Analysis of nutrition and health related packaging information present on UPF from five high-market-share food manufacturers and one supermarket own brand revealed almost all products featured marketing techniques to promote health and wellbeing, despite the typically poor nutritional quality of these foods. In addition over half included nutrition or health claims, and many achieved HSR scores incorrectly indicating they were a healthy choice. Parents of young children experienced difficulty in identifying healthy packaged foods, and they were unable to decipher packaging information due to information overload. Current CSR efforts by food companies have not succeeded in assisting consumers to select healthy packaged foods. In fact, the information provided by food manufacters was not trusted, and the government-led HSR was poorly utlised by consumers seeking to identify healthy foods. However, parents demonstrated some trust in supermarkets, and indicated that structural changes within the supermarket could assist them.

Chapter 5 RESULTS: THE CONTRIBUTION OF SUPERMARKET OWN BRAND FOODS TO CONSUMER NUTRITION ENVIRONMENTS

This chapter includes a published manuscript:

Pulker CE, Trapp GSA, Scott JA, Pollard CM. Alignment of supermarket own brand foods' front-of-pack nutrition labelling with measures of nutritional quality: An Australian perspective. *Nutrients*. 2018; 10: 1465. *(Nutrients has an impact factor of 4.196.)*

5.1 Overview of the chapter

The objective of this chapter is to provide an overview of the database of Australian supermarket own brand food marketing practices, and an example of how it has been used to respond to a policy-relevant question. The main research question addressed was: (1) What is the extent and nature of supermarket own brand foods in Australia?

The chapter includes a publication which uses some of the data obtained in the supermarket audits to explore the real world implications of government policy on public health. Supermarket support of the government-led voluntary Health Star Rating (HSR) front-of-pack nutrition label provides an example of a CSR commitment that can impact public health. Research questions were: (2) What is the prevalence of nutrition labels on the front-of-pack of Australian supermarket own brand foods? (3) How do Australian foods rate for nutritional quality? (4) Are Australian supermarkets using HSR to promote nutritious or nutrient-poor own brand foods?

5.2 Database of Australian supermarket own brand food marketing practices

Data extracted from approximately 20,000 photographic images of 3940 supermarket own brand foods present in three large supermarkets in Perth, Western Australia [403] were used to compile a database of supermarket own brand food marketing practices to identify the extent and nature of supermarket own brand foods in Australia.

Supermarket own brands have been described as leading the growth in availability of chilled convenience foods [247] (i.e. ready-prepared mixed foods requiring refrigeration including pizza, ready meals, dips, pies, and quiches), so back-of-pack photographs of 300 chilled convenience foods were also included.

The database of supermarket own brand food marketing practices can be used to assess the contribution of own brand foods to all aspects of supermarket consumer nutrition environments (i.e. products, price, placement, and promotion). Relevant research questions were identified in Chapter 3 (Table 3.2). The extensive information contained within the database is not appropriate for presentation in this thesis. However, utility of the database is demonstrated by responding to two policy-relevant questions.

Firstly, this chapter examines Australian supermarket support of the government-led HSR front-of-pack nutrition label, which aims to assist customers to select healthier packaged foods. Supermarkets have been identified as key supporters of the label, but the ability of HSR to promote food selection consistent with the Australian Guide to Healthy Eating (AGTHE) [3] has not been adequately demonstrated [117-119]. Study six (section 5.3) used information from the database to examine prevalence of the HSR and other front-of-pack nutrition labels on supermarket own brand foods, their nutritional quality, and whether HSR was used to promote nutritious or nutrient-poor supermarket own brand foods.

Secondly, study eight (section 6.3) derived evidence of supermarkets putting CSR commitments into practice from the database. CSR practice has been described as having a more direct influence over consumer nutrition environments than CSR commitments [164], therefore audit data provided important evidence of how supermarket CSR commitments and practical implication can impact public health nutrition in Australia.

5.3 Publication #6: Alignment of supermarket own brand foods' front-of-pack nutrition labelling with measures of nutritional quality: an Australian perspective [1]

5.3.1 Abstract

Two voluntary front-of-pack nutrition labels (FOPNL) are present in Australia: the government-led Health Star Ratings (HSR) and food industry-led Daily Intake Guide (DIG). Australia's two largest supermarkets are key supporters of HSR, pledging uptake on all supermarket own brand foods (SOBF). This study aimed to examine prevalence of FOPNL on SOBF, and alignment with patterns of nutritional quality. Photographic audits of all SOBF present in three large supermarkets were conducted in Perth, Western Australia, in 2017. Foods were classified as nutritious or nutrient-poor based on the Australian Guide to Healthy Eating (AGTHE), NOVA level of food processing, and HSR score. Most (81.5%) SOBF featured FOPNL, with only 55.1% displaying HSR. HSR was present on 69.2% of Coles, 54.0% of Woolworths, and none of IGA SOBF. Half (51.3%) of SOBF were classified as nutritious using the AGTHE, but using NOVA 56.9% were ultra-processed foods. Nutrient-poor and ultra-processed SOBF were more likely than nutritious foods to include HSR, yet many of these foods achieved HSR scores of 2.5-stars or above implying they were a healthy choice. Supermarkets have a powerful position in the Australian food system, and they could do more to support healthy food selection through responsible FOPNL.

5.3.2 Introduction

Front-of-pack nutrition labels (FOPNL) have the potential to provide consumers with a convenient guide to healthy food selection [404]. It is a highly contested area of food labelling [116], and a variety of scoring systems and visual devices exist. They include initiatives from the food industry (e.g. the international Choices Program [405]), government agencies (e.g. the UK traffic lights [406]), and some supermarket scoring

[1] This is the accepted version of the following article: Pulker CE, Trapp GSA, Scott JA, Pollard CM. Alignment of supermarket own brand foods' front-of-pack nutrition labelling with measures of nutritional quality: An Australian perspective. *Nutrients*. 2018; 10: 1465, which has been published in final form at https://doi.org/10.3390/nu10101465.

systems that are applied to shelf-edge-labels of all foods (e.g. Guiding Stars [302]). These FOPNL have been described using a continuum with reductive (i.e. facts only, with no evaluation or recommendation) at one end, and evaluative (i.e. presence of the device indicates compliance with predefined criteria) at the other, with hybrid or interpretive (i.e. a combination of facts and symbols) in the middle [407]. They have also been categorised as nutrient-specific systems (i.e. display the amount per serving of selected nutrients), summary indicator systems (i.e. a single symbol, icon, or score is used to summarise the nutrient content), and food group information systems (i.e. symbols are used to indicate presence of a specific food group) [404]. The policy objectives of each initiative can differ, with some labelling systems which have been designed according to best practice for effective product labels more likely to lead to changes in consumer purchasing behaviour than others [378, 404]. The American Institute of Medicine recommends use of a single standardized FOPNL, which appears on all products in settings such as supermarkets, is promoted to consumers, and encourages reformulation of processed foods [408]. In addition, FOPNL that are led or endorsed by governments and international health agencies are generally regarded as the most credible [409].

5.3.2.1 Front-of-pack nutrition labels in Australia

FOPNL is voluntary in Australia, and there are two commonly applied labelling systems. The government-led Health Star Rating system (HSR) was designed to guide selection of healthier packaged foods, and uses a nutrient profiling algorithm to assign each product a score from ½ to 5 health stars, with 5 stars indicating the healthiest choice [53]. Launched in 2014, the original policy aim of the HSR was to guide consumers who have a wide range of literacy and numeracy skills to select healthier foods by enabling comparison between individual foods, and increasing awareness of the nutritional quality of foods, consistent with national dietary guidelines [3, 115]. The objective of the HSR is summarised as: *"To provide convenient, relevant and readily understood nutrition information and/or guidance on food packs to assist consumers to make informed food purchases and healthier eating choices"* [410]. The food industry-led Daily Intake Guide (DIG), introduced in 2006 [376], aims to inform food selection by providing nutrition information for a serving of the product on the front-of-pack, along with contribution to the daily intake of an average adult [333] (Figure App 7.3). Comparison of the impact of the two Australian systems on consumer food choice

concluded that interpretive labels (or summary indicator systems) such as the HSR can be more effective than reductive labels (or nutrient-specific systems) such as the DIG in guiding food selection [411, 412]. However, a New Zealand randomized controlled trial which compared the effectiveness of traffic light labels, HSR and a control found the interpretive nutrition labels had no effect on food purchases [413]. The authors attributed this finding in part to low uptake of HSR on packaged foods in New Zealand and lack of awareness of the system [413]. To date, there is a lack of 'real world' evidence of the effectiveness of government-led FOPNL on consumer purchasing behaviour [378]. Therefore, the need to evaluate the impact of such labelling initiatives on public health continues.

Development of the HSR in Australia has not benefitted from the same levels of transparency given to development of FOPNL and nutrient profiling criteria in countries such as the UK [414-416] and France [417-421]. Although there has been considerable effort made by public health researchers to assess the potential impact of FOPNL on consumer purchasing behaviour since implementation of the HSR, there were no peer-reviewed studies that informed the development, validation, or implementation of the system [407]. This may have been because the HSR algorithm was not specifically designed from scratch to meet its policy aim. HSR system developers utilised the nutrient profiling criterion adopted by Food Standards Australia New Zealand (FSANZ) to determine whether foods were eligible to make health claims on packaging, which were in turn based on the UK nutrient profiling criterion used by Ofcom to determine whether foods could be advertised to children [422]. Whilst the UK model is the most widely used and validated (for its purpose), adaptation from the original categorical scoring to continuous scoring for a mnemonic device on pack required technical decision-making, including setting HSR score cut-offs, that is currently unknown. In addition, a recent evaluation found that alignment between the two Australian nutrient profiling systems (i.e. HSR and FSANZ health claims) needed improving [423].

Given this lack of transparency, Australian researchers have sought to determine the ability of the HSR to assist consumers to select foods consistent with the recommendations of the Australian Dietary Guidelines [3]. To assist consumers to select recommended nutritious five food group foods (a) the algorithm that underpins the HSR needs to correctly allocate scores that are consistent with national dietary

guidelines, (b) the HSR should be widely applied to packaged foods, and (c) consumers who have a wide range of literacy and numeracy skills should understand how to use the HSR to guide selection of nutritious foods. The ability of the HSR to identify nutritious foods has been examined by studies seeking to determine whether total sugar should be substituted with added sugar in the HSR algorithm [424], and test the accuracy of HSR scores for dairy foods [425]. Researchers have attempted to measure uptake of the voluntary HSR on packaged foods [426], and examine the preference and ability of consumers to use HSR in a number of studies [412, 427-431]. In addition, HSR may encourage reformulation of packaged food to improve the nutrient profile, which has been assessed in New Zealand [432] and Australia [433].

Two studies have specifically assessed congruence between HSR and the Australian Dietary Guidelines [3], with important differences in findings [117, 119]. One concluded that the "*scope of genuine misalignment between the [Australian Dietary Guidelines] and HSR algorithm across the Australian food supply is very small*" [119] (p11), whilst the other concluded that "*the HSR system is undermining the [Australian Dietary Guideline] recommendations*" as it did not consistently demarcate between nutritious and nutrient-poor foods [117] (p11). The difference in findings from these two studies can be explained by examining the methodologies employed, summarised in Table 5.1. Methodological decisions made about extracting or calculating the HSR score, rigour of food group classification, and allocating HSR cut-off points that are deemed appropriate to indicate nutritious and nutrient-poor foods, can influence study findings regardless of sample size. Questions about the ability of HSR to assist Australian consumers to select nutritious foods therefore remain.

Table 5.1 Methodological decisions that can influence study findings on whether Health Star Rating product scores are consistent with recommendations of the Australian Dietary Guidelines.

Methodological decision	Study 1 [119]	Study 2 [117]
Source of data	The George Institute for Global Health's Australian FoodSwitch Database, which conducts annual surveys and receives data from manufacturers and consumers	The Mintel Global New Products Database which collects packaging data and images of all new packaged foods launched in Australia and New Zealand
Date	1 January 2013 - 30 June 2017	27 June 2014 - 30 June 2017
Number of products included in analysis	n=65,660	n=1269
HSR product score	Calculated from nutrition information present on pack, and proxy values were estimated for missing values (e.g. fruit, vegetable, nut, legume, or fibre content which are not required on labels)	Extracted from packaging photographic images, not calculated for products with no HSR displayed
Classification of products consistent with the recommendations of the Australian Dietary Guidelines	Classification of recommended nutritious foods was informed by the Australian Dietary Guidelines [3]; classification of nutrient-poor foods utilized the Australian Bureau of Statistic's Discretionary Food List [228].	Classification of recommended nutritious foods was informed by the Australian Dietary Guidelines Educator's Guide [227]; classification of nutrient-poor foods utilized the Australian Bureau of Statistic's Principles for Identifying Discretionary Foods, and the Discretionary Food List [228]. Products difficult to classify were coded by each author individually and then a consensus decision made.
Determination of HSR scores consistent with the Australian Dietary Guidelines	No justification provided. However, a study which analysed alignment of the HSR with the Traffic Light system used by the New South Wales Government to identify nutritious foods in settings such as schools, hospitals, and workplaces recommended that foods with HSR $\geq$ 3.5 were more likely to be 'green' or nutritious [356].	A HSR of 2.5 was deemed to be a 'pass' rating appropriate for nutritious foods; a HSR of 2.0 or lower was deemed to be a 'fail' rating appropriate for nutrient-poor foods.

Methodological decision	Study 1 [119]	Study 2 [117]
HSR demarcation of recommended nutritious foods and nutrient-poor foods	Nutritious foods should not have a HSR ≤ 2.0 Nutrient-poor foods should not have a HSR ≥ 3.5	Nutritious foods should not have a HSR ≤ 2.0 Nutrient-poor foods should not have a HSR ≥ 2.5

5.3.2.2 Front-of-pack nutrition labels on supermarket own brand foods

Supermarkets have been identified as key supporters of FOPNL. In Australia, the two dominant supermarket chains who account for over 70% of Australian grocery sales [22] pledged to implement the HSR on all supermarket own brand foods (SOBF) [52], and therefore stop using the DIG [376]. SOBF (also known as private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers, wholesalers or distributors and sold privately in their own stores [27]. These products make a significant contribution to the global food supply and are predicted to grow until they dominate, led by the world's largest supermarket chains [57]. In Australia, SOBF are predicted to reach 35 percent of grocery sales by 2020 [124]. Other packaged foods, or branded foods (also known as national brands, manufacturer brands, premium brands), are owned by food manufacturers [27]. Data from 2017 indicated two supermarket chains, Coles and Woolworths, and discount retailer Aldi contributed over half of the products adopting the HSR in Australia [426]. Similarly, a UK study found that almost all products that carried the government-endorsed traffic light system in the first two years of implementation were SOBF from three supermarket chains [434]. Supermarkets in other countries have implemented nutrient profiling schemes to guide healthy food choice on shelf-edge labels [51], and set targets for the amount of healthy foods sold [435].

Supermarkets have a powerful position in the Australian food system [322] and their decision to support the HSR is significant. Specific examination of uptake of FOPNL on SOBF, and alignment with patterns of nutritional quality are therefore warranted. Assessing FOPNL present on SOBF is important to monitor ongoing implementation of HSR. Alignment of HSR scores on SOBF with the national food selection guide (Australian Guide to Healthy Eating (AGTHE) [3]) can inform the likely impact of the labelling system on public health, given their leadership in HSR implementation and market share. Application of the NOVA classification of level of food processing [67]

adds to the analysis of alignment between systems used to measure nutritional quality of foods and HSR.

This study aimed to address three research questions: (1) What is the prevalence of nutrition labels on the front-of-pack of Australian SOBF? (2) How do Australian SOBF rate for nutritional quality using three different measures: the AGTHE (food group based), NOVA (food processing based), and HSR (nutrient based)? (3) Are Australian supermarkets using the HSR to promote nutritious or nutrient-poor own brand foods?

5.3.3 Materials and methods

This study provides a 'moment-in-time' examination of SOBF in Perth, Western Australia, including prevalence of the DIG and HSR on SOBF, the HSR scores present, and the nutritional quality of SOBF displaying and not displaying the HSR. Alignment of the HSR with other measures of nutritional quality is also analysed (Figure App 7.4).

5.3.3.1 Selection of supermarkets

Supermarket audits were conducted in one of each major supermarket chain present in Western Australia, i.e. Coles Supermarkets Australia Pty Ltd (Coles), Woolworths Supermarkets (Woolworths), and Independent Grocers of Australia supermarkets (IGA). Aldi was excluded from this audit due to the different nature of the retail outlets whereby a limited range of mainly SOBF are sold at discounted prices [325]. The selected supermarkets were conveniently located in Perth in Western Australia, and were large stores with an increased likelihood of displaying most of the SOBF available. The selected Woolworths 'next generation' store had been recently extensively refurbished [326]. The selected IGA was an 'IGA store of the year' for Western Australia. The selected Coles was the nearest large store to the parent company Wesfarmers' offices.

5.3.3.2 Identification of supermarket own brand foods

Supermarket own brands were identified by use of the supermarket's branding on the front-of-pack, and by referring to the supermarkets' websites [436, 437]. All packaged foods and non-alcoholic beverages (referred to simply as 'food' hereon in) carrying a supermarket own brand were included in the supermarket audits, including packaged

unprocessed fresh food such as fruit, vegetables, and meat. The following foods were collected during the supermarket audits, but excluded from this study as the HSR is not an appropriate guide to selection: infant formula, infant food, baking ingredients (e.g. baking powder), culinary condiments (e.g. dried herbs and spices, salt, vinegar) plain coffee, and tea.

5.3.3.3 Data collection

Two researchers visited each of the three stores together during a three-week period commencing in February 2017, to conduct audits of SOBF. The main purpose of the audits was to assess the nature and extent of SOBF in Australia, including products available, price, placement, promotion, and nutritional quality. Therefore, data collection involved taking photographic images of the front-of-pack, the shelf-edge label that displayed the price, the location of the product within the store and on the shelf, and any promotional material present. Quality control procedures were implemented to ensure the photographic images captured all the required information for all SOBF present. Photographs were uploaded regularly to a laptop computer and checked for legibility at the end of each day. Any illegible photographs that could not be used were listed and retaken during subsequent visits.

5.3.3.4 Front-of-pack data extraction

Photographic images were filed electronically. Relevant details were extracted from the images into Excel databases created for each of the supermarkets. Within each supermarket's spreadsheet, 18 worksheets were created to capture the information for each product group. Product groups were designated based on the layout of the stores audited, where similar foods were co-located. Within each product group (e.g. bakery and desserts) food groups were created (e.g. biscuits, cakes). Pre-coded responses were established for each column for consistency of data entry. Free text was only permitted for information such as the product name and description. Data entry for the first food group was piloted to ensure all necessary information was entered and to establish any final pre-coding changes needed. Two researchers conducted data extraction from the photographic images. Both researchers reviewed the data for accuracy and changes were implemented by the first author as required to ensure consistency of approach.

The data extracted from the photographic images included information displayed on the front-of-pack such as supermarket own brand, product name and description, pack weight or volume, and voluntary nutrition labels. The FOPNL identified in this audit included: (a) the HSR only, (b) the HSR plus kilojoules per 100 grams, (c) the HSR plus kilojoules, saturated fat, sugars, sodium per 100 grams and an optional nutrient; (d) the HSR energy only icon [332]; (e) the DIG thumbnail icon which displays kilojoules per serve, and (f) the DIG preferred format of kilojoules, fat, saturated fat, sugars and sodium per serve [333].

5.3.3.5 Assessment of nutritional quality

The nutritional quality of all SOBF present was assessed using front-of-pack information only. Nutritional quality was assessed using the recommendations of the AGTHE, which identifies nutritious foods which are part of the recommended five food groups, and energy-dense-nutrient-poor or 'discretionary' foods which should be limited [3]. The NOVA classification of level of food processing which aims to address the impact of industrial food processing on health was also applied [67].

The HSR provided on the front-of-pack was recorded as displayed, and was not calculated for products where it was not present. Although the HSR is not intended to be used on fruit, vegetables, meat, poultry and fish, they are not excluded [333], therefore these products were not excluded from the analysis. A HSR of 2.0 or less was taken to be an appropriate cut-off for nutrient-poor foods, and a HSR of 2.5 or more appropriate for nutritious foods [117]. The use of 2.5 stars as a 'pass' rating is logical and has more credibility as a potential consumer education message than use of 3.5 stars [117]. For example, consumers could be advised that foods with HSR of at least 2.5 stars are more likely to be a nutritious choice. It is not logical to have a system which attributes 3 stars out of a possible 5 stars to a nutrient-poor food that is not consistent with the AGTHE and expect consumers to deduce it would be a poor food choice. It is also not consistent with dietary guidelines recommendations to discourage consumption of nutrient-poor discretionary foods. Qualitative research has confirmed that consumers tended to use the HSR in a binary way, categorising foods with HSR of 2 stars or less as unhealthy, and foods with HSR of 3 stars or more as healthier [430].

The AGTHE nutritious five food groups included: vegetables, legumes and beans; fruit; grain or cereal foods; lean meat, poultry, fish, eggs, tofu, nuts, and seeds; and

milk, yoghurt, cheese, and their alternatives. Nutrient-poor discretionary foods include items that are high in saturated fat, sugars, salt, or alcohol. Examples are provided in the Educator's Guide [227], however they are limited to whole foods, not meals or mixed foods, and provide overarching principles that can be applied to dietary analysis more easily than packaged food classification. The Australian Bureau of Statistics (ABS) has established principles for identifying discretionary foods [228]. The ABS principles were adapted for this study as there were many ready-to-eat products present in the audit which were not addressed by the ABS criteria, and product nutrition information was not available to inform classification. A decision tree was constructed to enable classification of products in accordance with the recommendations of the AGTHE, with the addition of two new food groups: 'Mixed products using mainly five food group foods', and 'Mixed products high in fat, salt or sugar' (Table App 7.7).

The NOVA classifications included: unprocessed or minimally processed foods (e.g. fruit, vegetables, meat, grains, nuts); processed culinary ingredients (e.g. salt, sugar, vegetable oils, butter); processed foods which are simple foods made with few ingredients (e.g. canned vegetables, canned fish, cheese, cured or smoked meat); and ultra-processed foods (UPF), which are nutrient-poor, industrial formulations that include ingredients or processes not found in the home (e.g. savoury snacks, cereal bars, biscuits, instant sauces, pre-prepared dishes such as pies and pizzas) [67]. Studies have shown UPF have higher saturated fat, sugar and sodium content compared to less processed foods [67, 73]. High levels of UPF consumption have been associated with excess weight [438], increased risk of cancer [439], and reduced diet quality [440]. The recommendations of the AGTHE and the HSR algorithm do not currently consider the level of food processing, however researchers have identified the benefits of incorporating consideration of the level of food processing into national policies to improve dietary health [70].

5.3.3.6 Statistical analysis

Data were analysed using the SPSS for Windows statistical software package version 24 (IBM Corp. Released 2016. Armonk, NY: IBM Corp USA). The frequency of use of six different formats of FOPNL was compared between the three supermarkets. A comparison of the frequency of HSR labels on foods classified using the AGTHE food groups, and the NOVA levels of food processing was produced. For SOBF displaying

the HSR, mean HSR, standard deviation, minimum, and maximum were derived for all AGTHE food groups and foods classified using the NOVA levels of food processing. Charts that displayed the frequency of HSR scores by supermarket chain, AGTHE food group, and NOVA level of food processing were prepared. Chi-square tests of independence were performed to: examine the relationship between presence of HSR on the front-of-pack of SOBF and their nutritional quality as assessed using the AGTHE and NOVA; and examine the relationship between foods that achieved a HSR of 2.5 or above and HSR of 2.0 and below and their nutritional quality as assessed using the AGTHE and NOVA.

5.3.4 Results

Approximately 20,000 photographic images were collected for 3940 SOBF in this audit. There were 1812 SOBF present in the Woolworths store, 1731 SOBF in the Coles store, and 397 SOBF in the IGA store. After excluding infant formula, infant food, baking ingredients, culinary condiments, plain coffee, and tea, there were 3737 SOBF included in this study: 1707 from Woolworths, 1645 from Coles, and 385 from IGA (Table 5.2).

5.3.4.1 Prevalence of front-of-pack nutrition labels on supermarket own brand foods

Most SOBF (81.5%) featured either the HSR or DIG on the front-of-pack (Table 5.2), no products included both. Over half of all SOBF (55.1%) featured the HSR. Coles had the largest proportion of foods featuring the HSR (69.2%), followed by Woolworths (54.0%), and the HSR was not present on any SOBF in IGA. The full HSR logo that includes kilojoules and nutrient information was the most commonly used version across Coles and Woolworths, present on 33.0% of all audited products. A quarter of SOBF (26.4%) featured the DIG. The DIG was present on most IGA SOBF (81.0%), 26.9% of Woolworths, and 13.0% of Coles SOBF.

Analysis of presence of FOPNL on SOBF included packaged unprocessed fresh food such as fruit, vegetables, and meat (n=438) even though the HSR was not intended to be used on such foods. HSR was present on 4.1% of all packaged fresh foods including: fish, beef, pork, lamb, vegetables. DIG was present on 2.7% of all packaged fresh foods including: beef, pork, lamb, herbs, chicken and vegetables.

Table 5.2 Front-of-pack nutrition labels present on supermarket own brand foods in Australia

	Coles		Woolworths		IGA		All supermarkets	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Health Star Rating with kJ and nutrients	662	40.2%	570	33.4%	0	0.0%	1232	33.0%
Health Star Rating with kJ	149	9.1%	118	6.9%	0	0.0%	267	7.1%
Health Star Rating only	318	19.3%	233	13.6%	0	0.0%	551	14.7%
Health Star Rating energy only icon	9	0.5%	0	0.0%	0	0.0%	9	0.2%
Sub-total: Health Star Rating present	*1138*	*69.2%*	*921*	*54.0%*	*0*	*0.0%*	*2059*	*55.1%*
Daily Intake Guide with kJ and nutrients	185	11.2%	408	23.9%	159	41.3%	752	20.1%
Daily Intake Guide kJ only	29	1.8%	52	3.0%	153	39.7%	234	6.3%
Sub-total: Daily Intake Guide present	*214*	*13.0%*	*460*	*26.9%*	*312*	*81.0%*	*986*	*26.4%*
Total: Front-of-pack nutrition labels present	*1352*	*82.2%*	*1381*	*80.9%*	*312*	*81.0%*	*3045*	*81.5%*
Total	**1645**		**1707**		**385**		**3737**	

5.3.4.2 Nutritional quality of supermarket own brand foods using the Australian Guide to Healthy Eating

Using the principles of the AGTHE, half (51.3%) of the SOBF present in this study were classified as nutritious foods, 46.6% were nutrient-poor, and 2.1% were culinary ingredients (e.g. mustard, liquid stock) (Table 5.3). The nutritious food group with the most SOBF present was the meat and meat substitute group which included lean meat, fish, eggs, tofu, nuts and seeds (14.0%), followed by grain or cereal foods (13.0%). However, the proportion of nutrient-poor discretionary SOBF present was far greater at 45.2%.

5.3.4.3 Nutritional quality of supermarket own brand foods using NOVA

Over half (56.9%) of all SOBF were classified as UPF (Table 5.3). A quarter (24.8%) of SOBF were unprocessed or minimally processed, 15.1% were processed foods, and 3.2% were processed culinary ingredients.

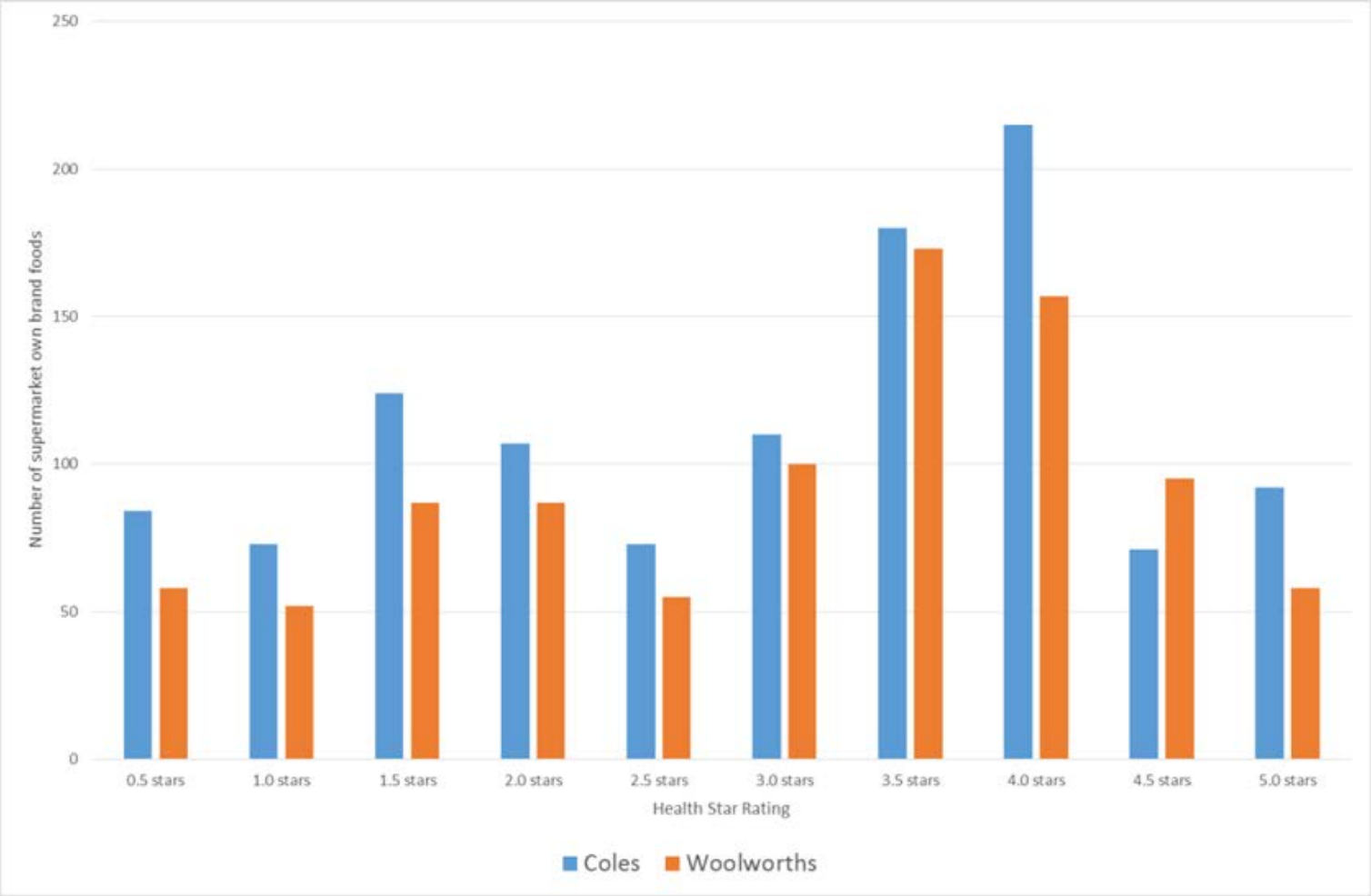
5.3.4.4 Nutritional quality of supermarket own brand foods using Health Star Rating scores

The HSR was not calculated for foods that did not display the device (n=1688), so the dataset used for analysis includes 2049 SOBF. The mean HSR of all SOBF was 2.96 (range 0.5-5.0, n=2049). The mean HSR for Coles SOBF was 2.92 (range 0.5-5.0, n=1129); and the mean HSR for Woolworths SOBF was 3.01 (range 0.5-5.0, n=921). The most frequently occurring HSR scores were 3.5 stars (Coles n=180, Woolworths n=173) and 4.0 stars (Coles n=215, Woolworths n=157) (Figure 5.1). More of the Woolworths SOBF scored HSR of ≥2.5 compared to Coles SOBF (69.1% for Woolworths, 65.7% for Coles).

Table 5.3 Health Star Rating scores for supermarket own brand foods in Australia, classified by nutritional quality

	Supermarket own brand foods present		Supermarket own brand foods displaying HSR		Health Star Rating			
	N	**%**	**N**	**%**	**Mean**	**SD**	**Min.**	**Max.**
Australian Guide to Healthy Eating food groups								
Nutritious foods								
Vegetables, legumes and beans	351	9.4	101	4.9	4.34	0.604	2	5
Fruit	166	4.4	77	3.8	4.04	0.802	2.5	5
Grain or cereal foods	484	13	263	12.8	3.92	0.727	1.5	5
Lean meat, fish, eggs, tofu, nuts and seeds	523	14	223	10.9	4.11	0.524	2	5
Milk, yogurt, cheese, alternatives	185	5	113	5.5	3.04	1.258	0.5	5
Mixed product using mainly five food group foods	184	4.9	172	8.4	3.65	0.376	3	4.5
Water	25	0.7	11	0.5	5	0	5	5
Sub-total: nutritious foods	*1918*	*51.3*	*960*	*46.9*	*3.88*	*0.806*	*0.5*	*5*
Nutrient-poor foods								
Discretionary foods	1689	45.2	1025	50.1	2.09	1.102	0.5	5
Mixed product high in fat sugar or salt	52	1.4	50	2.4	2.90	0.995	0.5	4
Sub-total: nutrient-poor foods	*1741*	*46.6*	*1075*	*52.5*	*2.13*	*1.11*	*0.5*	*5*
Other foods								
Culinary ingredients/ other	78	2.1	14	0.7	3.64	0.929	2	5
NOVA food processing classification								
Unprocessed or minimally processed	928	24.8	313	15.3	4.35	0.79	0.5	5
Processed culinary ingredients	119	3.2	59	2.9	2.62	1.303	0.5	5
Processed foods	564	15.1	341	16.6	3.46	1.114	0.5	5
Ultra-processed foods	2126	56.9	1336	65.2	2.52	1.178	0.5	5
Total	**3737**		**2049**	**54.6**	**2.96**	**1.31**	**0.5**	**5**

Figure 5.1 Frequency of Health Star Rating scores for supermarket own brand foods



5.3.4.5 Alignment between Health Star Rating and other measures of nutritional quality

Supermarket own brand food groups classified as nutritious using the AGTHE achieved a range of mean HSR scores (Table 5.3). Mean HSR scores for nutritious food groups were all above the designated cut-off of 2.5 stars. Vegetables, legumes and beans had a mean HSR of 4.3; fruit had a mean HSR of 4.0; grain or cereal foods had a mean HSR of 3.9; lean meat, fish, eggs tofu, nuts, and seeds had a mean HSR of 4.1; milk, yogurt, cheese, and alternatives had a mean HSR of 3.0; and mixed foods using mainly five food group foods had a mean HSR of 3.7. However, Figure 5.2 shows the frequency of HSR scores for each food group; 26.5% of the milk, yogurt, cheese, and alternatives food group scored below 2.5 stars. Nutrient-poor SOBF failed to achieve mean HSR scores of the designated cut-off of 2.0 or below. Discretionary foods had a mean HSR of 2.1; and mixed foods high in fat sugar or salt had a mean HSR of 2.9. Figure 5.2 shows the frequency of HSR scores for these nutrient-poor foods; 39% of discretionary foods and 84% of mixed products high in fat sugar or salt scored HSR of 2.5 or over.

The food groups recommended in the NOVA classification system as the foundation of healthy dietary patterns, unprocessed and minimally processed foods, achieved a mean HSR of 4.4 (Table 5.3). Processed foods achieved a mean HSR of 3.5, and processed culinary ingredients achieved a mean HSR of 2.6. The food group recommended to be avoided in the NOVA classification system, nutrient-poor UPF, achieved a mean HSR of 2.5. Therefore nutrient-poor ultra-processed SOBF failed to meet the designated HSR cut-off of 2.0 or below. Figure 5.3 shows the frequency of HSR scores for the NOVA food groups: 98% of nutritious unprocessed or minimally processed foods scored HSR of 2.5 or over; however, 55% of nutrient-poor UPF also scored HSR of 2.5 or over.

Figure 5.2 Frequency of Health Star Rating scores for supermarket own brand foods classified using the principles of the Australian Guide to Healthy Eating

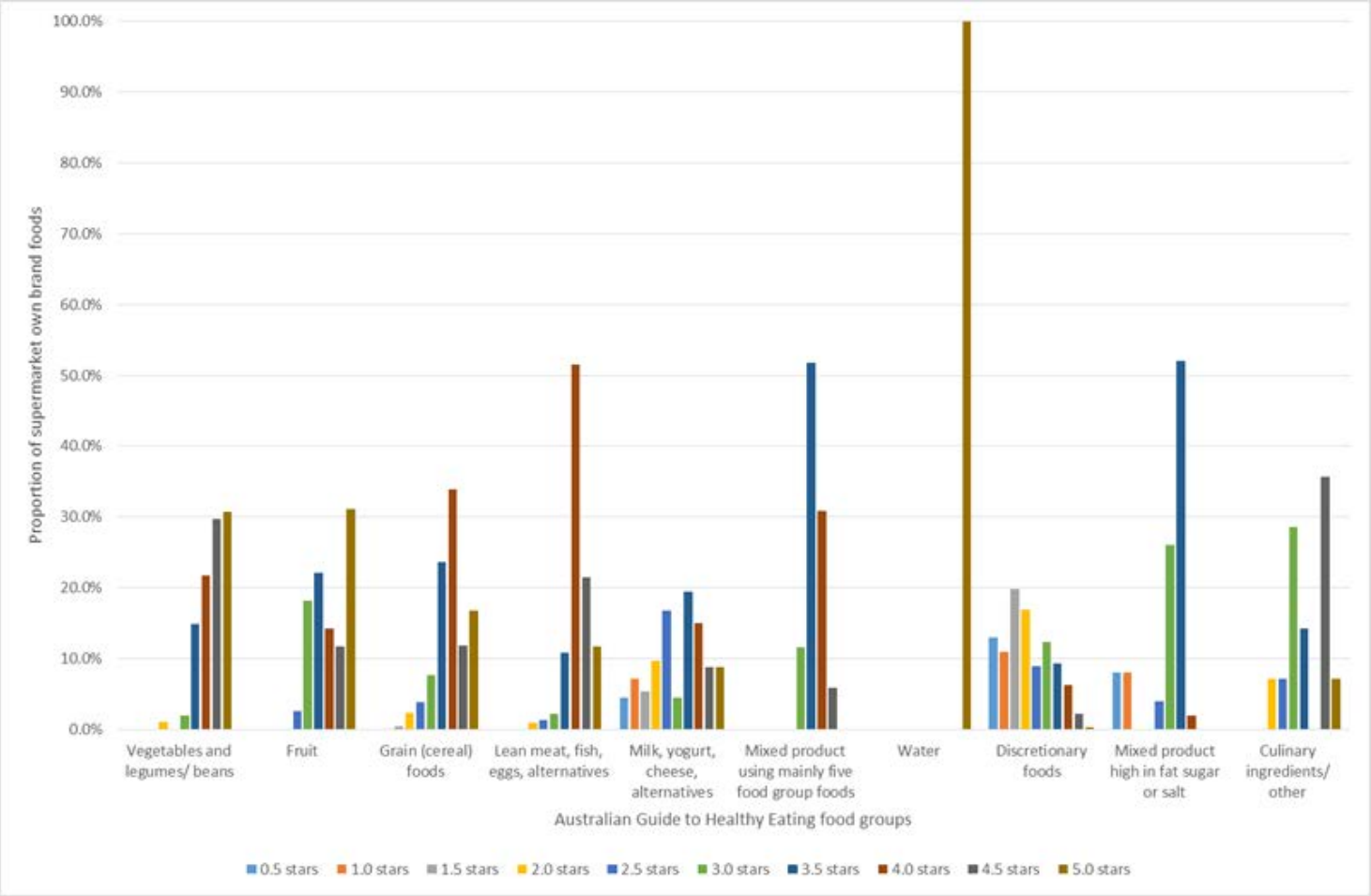
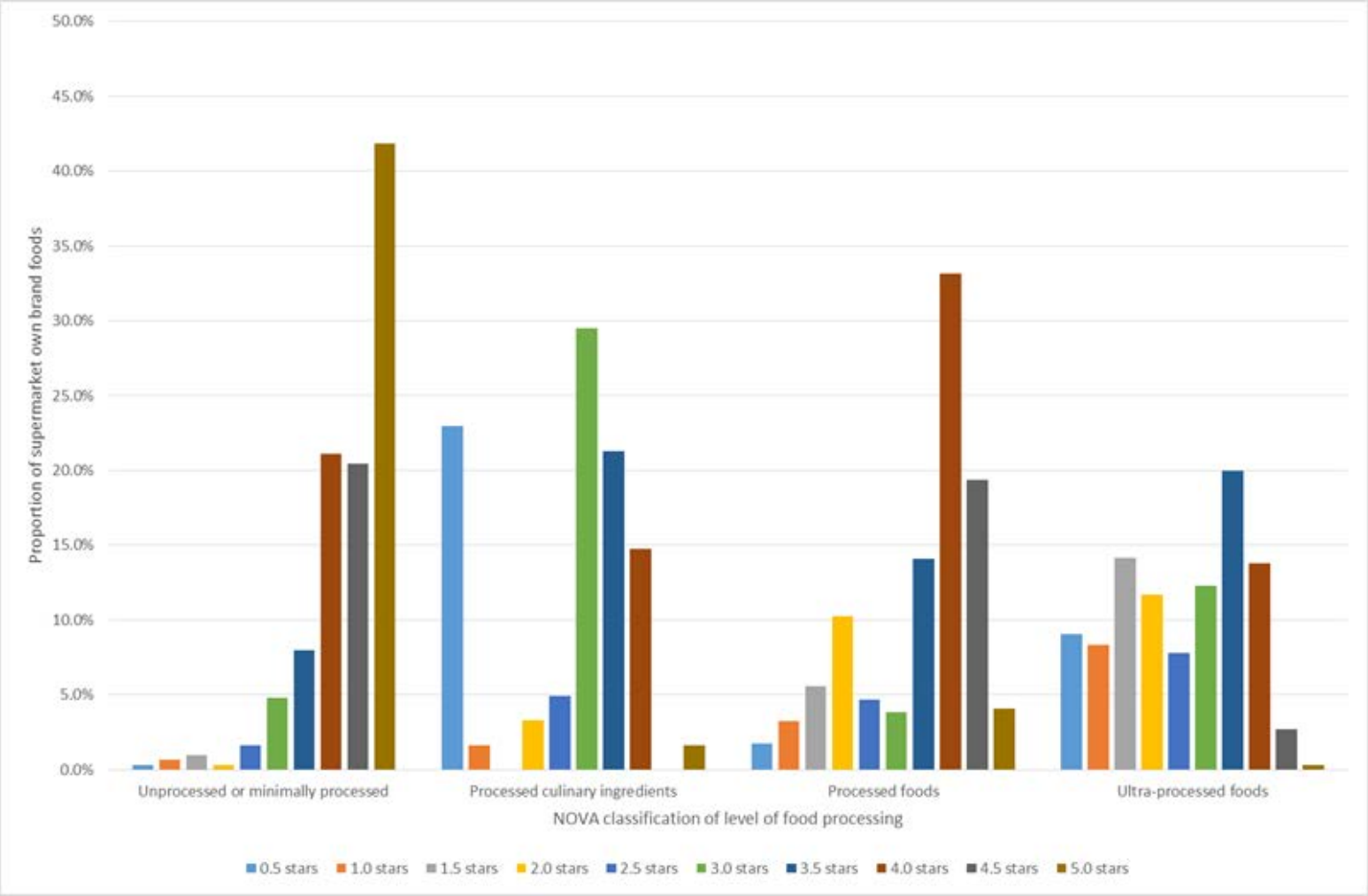


Figure 5.3 Frequency of Health Star Rating scores for supermarket own brand foods classified using the NOVA level of food processing



5.3.4.6 Presence of Health Star Ratings on nutritious and nutrient-poor supermarket own brand foods

A chi-square test of independence was performed to examine the relationship between presence of HSR on the front-of-pack of SOBF and their nutritional quality (Table 5.4). Using the AGTHE food group classifications, nutrient-poor SOBF were more likely to display HSR than nutritious foods. Using the NOVA classification of level of food processing, nutrient-poor UPF were more likely to display HSR than other foods.

Table 5.4 Chi-square test of independence between presence of Health Star Ratings on the front-of-pack of supermarket own brand foods and their nutritional quality

Nutritional quality	Health Star Rating present N (Percent)	No Health Star Rating present N (Percent)	Chi square tests of independence χ^2	p value
Australian Guide to Healthy Eating classification				
Nutrient-poor foods	1075 (52.8%)	666 (41.0%)	51.509	<0.001
Nutritious foods	960 (47.2%)	958 (59.0%)		
NOVA food processing classification				
Ultra-processed foods	1336 (65.2%)	790 (46.8%)	128.121	<0.001
All other foods	713 (34.8%)	898 (53.2%)		

A chi-square test of independence examined the relationship between foods that achieved a HSR of 2.5 or above (an appropriate score for nutritious foods) and HSR of 2.0 and below (an appropriate score for nutrient-poor foods) and other measures of nutritional quality (Table 5.5). Foods classified as nutritious using the principles of the AGTHE were more likely to display HSR $\geq$ 2.5 than nutrient-poor foods. However, foods classified as nutrient-poor UPF using NOVA were more likely to achieve a HSR $\geq$ 2.5 than all other foods. In addition, the results indicate that of the SOBF carrying a HSR label, 41.3% of AGTHE nutrient-poor foods and 4.2% of AGTHE nutritious foods were given inappropriate HSR scores.

Table 5.5 Chi-square test of independence between Health Star Rating scores and measures of nutritional quality

Nutritional quality	Health Star Rating ≤ 2.0	Health Star Rating ≥ 2.5	No Health Star Rating present	Chi square tests of independence	
	N (Percent)	N (Percent)	N (Percent)	χ^2	p value
Australian Guide to Healthy Eating classification					
Nutrient-poor foods	631 (94.0%)	444 (32.6%)	666 (41.0%)	732.303	<0.001
Nutritious foods	40 (6.0%)	920 (67.4%)	958 (59.0%)		
NOVA food processing classification					
Ultra-processed foods	577 (85.9%)	759 (55.1%)	790 (46.8%)	310.828	<0.001
All other foods	95 (14.1%)	618 (44.9%)	898 (53.2%)		

5.3.5 Discussion

Supermarkets play a powerful gatekeeper role in the Australian food system [322] and are key supporters of the government-led front-of-pack HSR system [52]. This study aimed to examine prevalence of the HSR and food industry-led DIG on SOBF in Australia. It also aimed to assess the nutritional quality of SOBF using the AGTHE [3] and NOVA levels of food processing [67], and identify whether uptake of the HSR was aligned with these measures.

This study found that most SOBF in Australia included a FOPNL of some kind. HSR was widespread on Coles SOBF, present on over half of Woolworths SOBF, but not present on any IGA SOBF which used the DIG instead. IGA supermarkets are independently operated and predominantly supplied with products by Australia's largest wholesaler Metcash, who is also responsible for marketing of IGA [286]. The decision not to add HSR to SOBF was therefore made by Metcash. In February 2018, Metcash stated they used the DIG instead of HSR as they believed it was "*more beneficial for shoppers… due to the increased nutritional information it provides*" [441]. It is interesting to note that Metcash is a member of the government-led Healthy Food Partnership (HFP) [442], which advocates use of the HSR as a key support to their work on product reformulation [443]. As HSR and the HFP are the only two Australian government initiatives which aim to address population dietary health, lack of HSR uptake by a HFP member deserves further examination.

Findings indicate that whilst good progress had been made in applying the HSR to SOBF, neither Coles nor Woolworths had fulfilled their commitments to label all SOBF with the HSR by 2016 [52]. This is important because the two supermarkets privately govern the Australian food system [444], and failure to fulfil commitments may erode trust in their ability. Only a third of SOBF from the bread and alternatives product group displayed either the HSR or DIG. However, many of these products were from the in-store bakery which carried labels with branding, ingredients and allergen information only. All foods carrying a supermarket own brand on the label were included in this study, including packaged fresh whole foods such as fruit, vegetables, fish and meat, which the HSR style guide states the system was not intended for [332]. However, few of the prepacked fresh foods displayed either the HSR or DIG. The only foods excluded from analysis were infant formula, infant food, baking ingredients, culinary condiments, plain coffee, and tea, as the HSR cannot usefully guide selection of these items. The HSR system is currently undergoing a five-year review, and one of the areas of consideration is the foods it should appear on [445]. Given an automatic five star rating currently applies to packaged water [332], which is a product not required to carry nutrition information [347], and the fact that supermarkets are currently displaying the HSR on selected fresh whole foods such as meat, it is logical to encourage its use across packaged whole foods, especially the nutritious foods recommended in the AGTHE [3]. Scoring of these recommended nutritious whole foods needs to be considered, one option being allocation of the same automatic five star rating as water. In addition, application of the HSR to shelf-edge tags for unpackaged or fresh whole foods, similar to the American Guiding Stars system [446], should be considered.

An assessment of the proportion of packaged products displaying the HSR in Sydney supermarkets in 2017 [426] had some differences in findings to this assessment of SOBF in Perth supermarkets. There were more SOBF identified in the Perth stores, which is only partly explained by the inclusion of pre-packaged whole fresh foods that carried an own brand on the label. Some of these foods, including packaged fresh meat, displayed the HSR which was the reason for their inclusion. There were more Coles SOBF foods which carried the HSR on labels identified in the Sydney audit (1246 versus 1128), which could be a result of differences in the products sold between locations, or the timing of the audits. The differences were more pronounced when

comparing findings for Woolworths. The Perth audit identified considerably more Woolworths SOBF foods which carried the HSR (921 versus 713), however the greater number of SOBF overall meant that the proportion reported in this study was significantly lower compared to the Sydney-based study [426]. Similarly, there were considerable differences in the IGA findings. More than double the number of SOBF were identified in the Perth audit compared to the Sydney audit. IGA supermarkets are not centrally managed, and available products are selected by the owner or manager. Therefore, the difference in the number of SOBF is not surprising. Studies found no (or one) IGA SOBF carried the HSR. These differences in findings for the number of SOBF present, and the proportion displaying the HSR, indicate that examination of differences in product availability between the Australian States and Territories is needed. This is important because most Australian studies assessing attributes of supermarket environments to date have been conducted in Sydney and Melbourne [444], and findings may not translate to other metropolitan areas within Australia.

The nutritional quality of SOBF identified in this study was assessed using three different measures: the AGTHE [3], NOVA [67], and HSR [447]. Most Australians do not eat the recommended amount of nutritious foods needed for good health, and a third of population energy intake was from nutrient-poor discretionary foods in 2011-12 [4]. Only half of the SOBF present were classified as nutritious foods recommended by the AGTHE. This proportion is higher than that of a recent evaluation of the nutritional quality of the Australian food supply [68], only partly explained by the inclusion of packaged fresh whole foods in this study. Over half of the SOBF present were classified as nutrient-poor UPF. This is consistent with other studies that have found a large proportion of such highly processed foods present in the Australian food supply [68, 77]. In fact, most new products launched in Australia in 2015 were UPF [79]. Supermarkets control development of SOBF by suppliers and can determine the nutritional quality [24]. They can also use SOBF to influence consumer food choice [125]. This study shows that more effort is needed by Australian supermarkets to ensure their contribution to the food supply supports healthy food selection.

A range of mean HSR scores were obtained for each of the AGTHE nutritious five food groups in this study. Three of the five food groups achieved a mean HSR above 4 stars, and few of these foods scored less than 2.5 stars. However, of the recommended dairy foods with HSR present, a quarter failed to be scored as nutritious. Previous

investigation of the ability of HSR to identify nutritious dairy foods also found a large proportion scored less than 2.5 stars, particularly hard cheeses [222]. The authors attributed this finding to the contribution of saturated fat content to the HSR algorithm [222]. Technical flaws in the ability of the HSR algorithm to identify recommended dairy foods have also been identified by Lawrence *et al.* [117]. The mean HSR scores for nutrient-poor discretionary foods, mixed products high in fat sugar or salt, and UPF, and the predominance of UPF with HSR scores indicating they were nutritious choices, further illuminate the inconsistencies between HSR and other measures of nutritional quality. This study's findings indicate the HSR algorithm currently fails to score recommended dairy foods, discretionary foods, mixed products high in fat sugar or salt, or UPF appropriately.

The French FOPNL was also based on the UK nutrient profiling model used by Ofcom to regulate food advertising to children [421]. Unlike the HSR, the French Nutri-Score label underwent analysis for consistency with the French nutritional recommendations, whereby adaptations were made to the algorithm to improve the ability of the system to discriminate between recommended and nutrient-poor foods [421]. In Australia, a wide variety of nutritious five food group foods are recommended [227]. Advice is also given on the amount to eat and best choices to make, for example: choose canned legumes and vegetables without added salt, whole fruit is preferable to fruit juice, wholegrains are preferable to refined grains, no more than 455g of cooked lean red meat is recommended each week, low and reduced-fat dairy foods are better choices for most people compared to full-fat dairy foods [227]. Adapting the algorithm to ensure it promotes the recommendations of the Australian Dietary Guidelines using the same three levels of detail examined in the French study [421] is recommended: across food groups (i.e. nutritious and nutrient-poor food groups obtain scores that are demarcated); within food groups (i.e. best choices and all other choices obtain scores that are demarcated); and similar products from different brands obtain scores that allow for meaningful comparison.

A number of studies have assessed the alignment of FOPNL with dietary guidelines, and there is a current lack of consistency in the cut-off scores assigned to identify nutritious and nutrient-poor foods. For example, the French study that assessed the ability of the Nutri-Score label to discriminate nutritional quality stated that foods to be encouraged (i.e. nutritious foods) should have a green or yellow rating, and foods

to be limited (i.e. nutrient-poor or energy-dense foods) should have a pink or red rating; the midway rating of orange was not applied to either group [421]. Applying the same cut-off principles to the HSR would translate to nutritious foods attaining ≥3.5 stars, and nutrient-poor foods attaining ≤2.0 stars. One Australian study assigned cut-off scores to identify HSR that were '*apparent outliers'* stating nutrient-poor foods should not score ≥3.5 stars, and nutritious foods should not score ≤2.0 stars [119]. Other Australian studies have used HSR of 3.5 as a cut-off to distinguish between foods that are recommended in the dietary guidelines, and nutrient-poor discretionary foods [68, 424, 426, 448]. They refer to work which analysed alignment of the HSR with the colour coded Traffic Light system used by the New South Wales Government to identify nutritious foods in settings such as schools, hospitals, and workplaces [356]. Another Australian study used HSR of ≥2.5 to indicate scores that are appropriate for nutritious foods [117]. Given FOPNL is a highly contested area of food labelling [116], and selection of HSR scores considered appropriate for nutritious and nutrient-poor foods can impact findings, robust and transparent analysis of the implications of HSR cut-off scores is recommended.

The current study's findings indicate that application of HSR by two supermarkets on SOBF has served to promote nutrient-poor food choices. Nutrient-poor and ultra-processed SOBF were more likely to include the HSR on the front-of-pack than nutritious foods, and many achieved HSR scores of 2.5 stars and over inaccurately indicating they were a healthy choice. These findings are likely to reflect flaws inherent in the system which are currently being considered in a five-year review [445], rather than supermarket decision-making *per se*. Decisions made by the HSR advisory committee to exclude foods such as packaged fruit, vegetables, meat, and fish from the expectation of HSR labelling, but assign an automatic five-stars to packaged water [332] means the recommendations of the Australian Dietary Guidelines [3] are not promoted consistently. Specific concerns about the ability of the HSR algorithm to promote recommended nutritious foods have also been raised [108, 117, 118, 449, 450]. Regardless, Australia's two largest supermarkets [22], which wield enormous power over the food system [322], have been key supporters of the HSR leading uptake on packaged food [426]. Coles and Woolworths have participated in Australian government-led population nutrition initiatives such as HSR and the HFP since 2009, but their influence is unknown [322]. In particular, lack of transparency over development, validation, and

implementation of HSR in Australia means the drivers of decision making remain hidden. Research to determine the nature and extent of influence by supermarkets, and others with vested interests, over decisions that affect national nutrition policy (i.e. HSR and HFP) is needed.

Strengths of this study include the large sample size, and the specific focus on examining use of FOPNL on SOBF which was driven by the commitment of two supermarkets to adopt the HSR across all SOBF. In addition, the supermarket audit methodology collected data over three weeks from three large stores, which were purposively selected to give an increased likelihood of most of the SOBF being available. The extensive data collection conducted over a short time period meant that only front-of-pack photographs were taken. Therefore the ABS discretionary food list, which uses nutrient cut-offs in some of its definitions, was not suitable for classification of foods consistent with the recommendations of the AGTHE in this study. However, a rigorous process was developed to ensure consistency in using front-of-pack information for classification, and some products displayed the full HSR label which includes nutrient information. Data were collected in Perth in Western Australia, and findings may not translate to other Australian metropolitan areas, as consistency in SOBF availability is currently not known. Seasonality may also affect findings, and as this study was conducted between the end of the Australian school summer holidays and Easter, supermarket audits conducted at other times of the year may find different SOBF availability.

5.3.6 Conclusions

This study found that most SOBF present in three Perth supermarkets included a FOPNL. HSR application was widespread on the Coles SOBF, present on over half of the Woolworths SOBF, but not present on any of the IGA SOBF which used the DIG instead. Nutrient-poor and ultra-processed SOBF were more likely to include the HSR on the front-of-pack than nutritious foods, and many of these foods achieved HSR scores indicating they were a healthy choice. Supermarkets have a powerful position in the Australian food system, and they could do more to support healthy food selection. Recommendations for supermarkets include:

(i) Use their influence and power by advocating to government for changes to the HSR algorithm, to ensure it achieves the original policy aim of identifying healthier foods consistent with the Australian Dietary Guidelines;

(ii) Apply the HSR to all foods including packaged unprocessed fresh foods such as fruit, vegetables, fish and meat;

(iii) After the algorithm has been modified to ensure it achieves the original policy aim, Coles and Woolworths should fulfil their commitments to label all SOBF with the HSR and remove the DIG from packaging. Metcash should support application of HSR to all SOBF and remove the DIG from packaging;

(iv) Consider setting targets to improve the proportion of SOBF that are classified as nutritious using the AGTHE, NOVA, or HSR score; and

(v) Increase transparency of contributions to key government-led initiatives that aim to improve the dietary health of all Australians (i.e. HSR and HFP).

In addition, future research recommendations include:

(i) Compare differences in SOBF availability between the Australian States and Territories, to determine whether supermarket audit findings can be translated between metropolitan regions.

(ii) Adapt the HSR algorithm to ensure it promotes the recommendations of the Australian Dietary Guidelines using three levels of detail: across food groups (i.e. nutritious and nutrient-poor food groups obtain scores that are demarcated); within food groups (i.e. best choices and all other choices obtain scores that are demarcated); and similar products from different brands obtain scores that allow for meaningful comparison. In particular, this study's findings indicate the HSR algorithm currently fails to score nutritious dairy foods, nutrient-poor discretionary foods, mixed products high in fat sugar or salt, or UPF appropriately.

(iii) Assess and report on the nature and extent of supermarket (i.e. Coles and Woolworths), and wholesaler (i.e. Metcash) influence over decisions that affect Australian food and nutrition policy, by analyzing their contribution to HSR and the HFP.

5.4 Summary of the chapter

The database of supermarket own brand food marketing practices was described in this chapter. The database identifies the extent and nature of supermarket own brand foods and their contribution to the healthfulness of Australian supermarket consumer nutrition environments. The extensive information was not presented, however the utility of the database was demonstrated by using findings to examine a policy-relevant question, i.e. what are the implications of the government-led HSR front-of-pack label for population dietary health? Analysis of supermarket application of HSR on own brand foods found it served to promote nutrient-poor food choices. In addition, one of the studies in Chapter 6 used the supermarket audit findings contained in the database to derive evidence of practical application of supermarket CSR commitments.

Chapter 6 RESULTS: SUPERMARKET CORPORATE SOCIAL RESPONSIBILITY COMMITMENTS TO PUBLIC HEALTH NUTRITION

This chapter includes a published manuscript and a manuscript that is under review:

Pulker CE, Trapp GSA, Scott JA, Pollard CM. Global supermarkets' corporate social responsibility commitments to public health: a content analysis. *Globalization and Health.* 2018; 14: 121. *(Globalization and Health has an impact factor of 3.031.)*

Pulker CE, Trapp GSA, Scott JA, Pollard CM. The nature of Australian supermarkets' corporate social responsibility commitments to public health nutrition and evidence of practice: a cross-sectional study. **Under review**.

6.1 Overview of the chapter

The objective of this chapter was to investigate Australian supermarket CSR commitments that can impact public health nutrition, and situate the findings within the international supermarket sector. Research questions were: (1) What public health related CSR commitments have been made by supermarket chains globally? (2) What is the nature and quality of Australian supermarket CSR policies that can impact public health nutrition? (3) Is there evidence of Australian supermarkets putting public health nutrition-related CSR policies into practice within their stores?

The chapter describes Australian supermarket CSR commitments (also referred to as CSR policies) that can impact public health nutrition, and evidence of practical application. Evidence of supermarkets putting CSR policies into practice was derived from the database of supermarket own brand food marketing practices (section 5.2), demonstrating its utility in answering policy relevant questions. The research findings are situated within the international supermarket sector, by investigating the world's

largest and most powerful supermarkets' publicly available CSR commitments to determine their potential impact on public health.

The chapter includes a published study which investigated the world's largest and most powerful supermarkets' publicly available CSR commitments to determine their potential impact on public health (section 6.2), and a study of Australian supermarkets' CSR policies which can impact public health nutrition and evidence of practical application (section 6.3), which is under review.

6.2 Publication #7: Global supermarkets' corporate social responsibility commitments to public health: a content analysis [1]

6.2.1 Abstract

Background: Supermarkets have unprecedented political and economic power in the food system and an inherent responsibility to demonstrate good corporate citizenship via corporate social responsibility (CSR). The aim of this study was to investigate the world's largest and most powerful supermarkets' publicly available CSR commitments to determine their potential impact on public health.

Methods: The world's largest one hundred retailers were identified using the Global Powers of Retailing report. Thirty-one supermarkets that published corporate reports referring to CSR or sustainability, in English, between 2013 and 2018, were included and thematically analysed.

Results: Although a large number of themes were identified (n=79), and there were differences between each business, supermarket CSR commitments focused on five priorities: donating surplus food to charities for redistribution to feed the hungry; reducing and recovering food waste; sustainably sourcing specific ingredients including seafood, palm oil, soy and cocoa; governance of food safety; and growing the number of own brand foods available, that are made by suppliers to meet supermarkets' requirements.

Conclusions: CSR commitments made by 31 of the world's largest supermarkets showed they appeared willing to take steps to improve sustainable sourcing of specific ingredients, but there was little action being taken to support health and nutrition. Although some supermarket CSR initiatives showed promise, the world's largest supermarkets could do more to use their power to support public health. It is recommended they should: (1) transparently report food waste encompassing the whole of the food system in their waste reduction efforts; (2) support healthful and

[1] This is the accepted version of the following article: Pulker CE, Trapp GSA, Scott JA, Pollard CM. Global supermarkets' corporate social responsibility commitments to public health: a content analysis. *Globalization Health*. 2018; 14: 121, which has been published in final form at https://doi.org/10.1186/s12992-018-0440-z.

sustainable diets by reducing production and consumption of discretionary foods, meat, and other ingredients with high social and environmental impacts; (3) remove unhealthful confectionery, snacks, and sweetened beverages from prominent in-store locations; (4) ensure a variety of minimally processed nutritious foods are widely available; and (5) introduce initiatives to make healthful foods more affordable, support consumers to select healthful and sustainable foods, and report healthful food sales as a proportion of total food sales, using transparent criteria for key terms.

6.2.2 Background

Globally, the proportion of foods sourced from supermarkets has increased [12]. A global 'supermarket revolution' has been taking place for the last thirty years, with phenomenal growth in supermarket sales in developing countries [451]. In 2017, IPES-Food reported that a third of global food sales were made by the ten largest supermarket chains [142], which highlights the important role of supermarkets in global food provision. The increase in supermarket food sales in developing countries has been at the expense of more traditional outlets, and is associated with dietary changes that may impact public health [12, 452]. For example, supermarkets tend to sell a wider variety of highly processed foods compared to traditional retailers, which can contribute to poor diets and increases in population overweight and obesity [12, 452].

6.2.2.1 Supermarket power and influence

Supermarkets have been described as having unprecedented and disproportionate power in the global food system [12]. A review of the sources of supermarket power in Australia identified them as being the primary gatekeepers of the food system [322]. Whilst companies from other sectors of the food industry, including food manufacturers, food service operators, and their industry associations, also wield political power [146], their influence over public policy compared to supermarkets has not been explored [322], and supermarkets are the focus of this study. Some large corporations such as supermarkets have greater economic power than governments [59]. In fact, some of the world's biggest corporations make more money than many countries [453]. Using financial data from 2015, supermarket chain Walmart ranked as the tenth largest global economy, higher than Australia at twelfth; and the top 250 global economies included nine supermarket chains [453]. With such great political and economic power, the relationship between corporation and society becomes critical.

One of the most important consequences of supermarket domination of the food system is growth in supermarket own brand foods [282]. Supermarket own brand foods (also known as private label, in-house brand, store brand, retailer brand, or home brand) are owned by retailers, wholesalers or distributors and are sold privately in their own stores [27], which means they have a dual role in manufacturing and retailing. There has been rapid development and global expansion of supermarket own brand foods [26, 29]. For example, in the UK, Spain and Switzerland, supermarket own brands account for up to 45% of national grocery sales [26]. The products can be sourced globally, so there is less dependence on local suppliers [24], enabling increased supermarket control over supply chains for greater returns [282].

6.2.2.2 Supermarket corporate social responsibility

The neoliberal political context favoured by large multi-national corporations aims to minimise the regulatory role of government in order to promote free trade [40]. This assumes market forces will establish the best outcomes for society. Supporters of the approach say voluntary corporate actions are lower cost, more flexible, and less adversarial than traditional regulatory approaches [150]. In response to concerns for the environment, in 1987 the United Nations (UN) called for a global agenda for change which considered the relationships between people, resources, environment and ongoing development [454]. The UN World Commission on Environment and Development suggested large corporations could do more to address this challenge [454].

Corporations have attempted to manage their impact on the world's resources and communities by implementing corporate social responsibility (CSR) strategies. These voluntary measures have been framed by food companies as socially responsible initiatives designed to ensure consumer welfare [44], however, CSR has been criticized as a means for food companies to prevent regulation [46], or place responsibility for selecting healthy foods onto consumers [45]. At the same time, CSR has been described as a source of structural power, whereby supermarkets are able to use CSR to set limits on the range of choices available to other food system actors (e.g. growers, manufacturers, consumers) by agenda-setting and rule-setting [47]. For example, Australian supermarkets have used CSR to exert control over farmers and growers by stipulating environmental management practices that must be met to achieve supplier status [322]. It has also been asserted that government regulation is the only effective

mechanism to prevent the public harm caused by unhealthy food, because the purpose of corporations is to maximise profit [145].

Whilst there is no agreed definition of CSR, Garriga and Melé (2004) have mapped the theories and approaches in a conceptual framework that includes: (i) instrumental, (ii) ethical, (iii) integrative, and (iv) political theories [59]. Instrumental theories describe CSR as a means to generate profits; ethical theories understand CSR as an ethical obligation of corporations to society; integrative theories argue that CSR is required because corporations rely on society for continued success; and political theories state that the power held by large corporations demands they act responsibly via CSR [59]. The main difference between the CSR theories which have been mapped in the conceptual framework is the apparent corporate motivation.

For the purpose of this study the political CSR lens is applied, whereby powerful supermarkets have an inherent responsibility to society, particularly when neo-liberal governments fail to protect their citizens [59]. Political CSR theories include 'corporate constitutionalism', which states that corporate power is limited by constituency groups within society, who demand corporations act responsibly; and if their power isn't used to benefit society it will be lost [59]. 'Corporate citizenship' is another political CSR theory which describes corporations as belonging to a community, which they need to take account of by acting responsibly, and addressing global challenges [58]. The political CSR lens does not include analysis of 'corporate political activity', which investigates the ways corporations attempt to influence political outcomes that can influence public health, for example by lobbying or using legal action [60].

6.2.2.3 Evaluation of CSR efforts

Assessment of CSR using a political lens is important to hold large companies, including food retailers, to account and a number of initiatives currently undertake this task. The political CSR approach is evident in the Access to Nutrition Index (ATNI) assessment of global food manufacturers' CSR impact on public health [160]. The ATNI aims to encourage food companies to make healthy products more accessible, and influence consumers' food choice and behaviour responsibly [160]. The ATNI has also garnered support from global investors, who have committed to factor the nutrition practices of food corporations into their investment decisions [455]. Despite the global proliferation of supermarket own brands [29], they are not currently included within the

ATNI's scope. The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) aims to standardise the monitoring of food environments in diverse countries and settings [9]. Food environments, also referred to as nutrition environments, include the settings (e.g. home, school, workplace, and food retail outlets including supermarkets and restaurants) that provide access to food [10]. INFORMAS have developed a country-level supermarket assessment tool to rate CSR policies and commitments related to obesity prevention and nutrition, based on the ATNI methods [166]. Analysis of Australian supermarkets recommends they take much stronger action [56].

Global reporting initiatives, including the FTSE4Good index [456] and the Dow Jones Sustainability index [457], encourage responsible corporate practices by reporting on performance to global investors. The UN Global Compact, which corporations can sign up to, encourages CSR by setting out ten guiding principles which cover human rights, labour, the environment, and anti-corruption [458]. In France, the *Grenelle Acts* enforced annual CSR reporting by large companies on 40 topics related to managing their social and environmental impact, and commitments to sustainable development [459]. The Global Reporting Initiative (GRI) Sustainability Reporting Guidelines provide a reference for disclosure of the environmental, social and economic impacts of global organisations, to achieve transparency in CSR reporting, and recommend corporate reports should reflect both positive and negative aspects of performance to provide balance [340]. The EAT-Lancet Commission, established to scientifically assess the changes needed to deliver healthy sustainable diets, will report on which companies control the global food system and whether change is considered possible [460].

To date, there have been few investigations of supermarket CSR commitments to public health internationally. Peter *et al.* (2007) studied the CSR activities of the top ten global food retailers, finding that only five supermarkets produced dedicated CSR reports [461]. Examination of CSR commitments to healthy eating by the largest supermarkets in the UK in 2005 concluded that they could do more to support their customers [50]. Despite being a nutrition initiative, the primary motivation for removing confectionery from prominent in-store locations was to achieve competitive advantage by appealing to customers [462]. Souza-Monteiro *et al.* (2017) analysis of UK supermarkets' CSR concluded it still appeared to be used as a tool for competition [463].

A US study of CSR commitments by the country's top 100 retailers revealed that food retailers, including supermarkets and restaurants, had the highest proportion of CSR content on their websites [464]. Their focus tended to be on social and environmental initiatives, such as sponsorship of local community charities and projects [464]. The examples illustrate the marked differences in the nature and content of supermarket CSR, with CSR activity rarely occurring at the expense of commercial priorities [461].

Supermarket CSR commitments to protect public health should encompass managing a healthy and sustainable food supply, including taking responsibility for food waste. Analysis of publicly available CSR commitments to reducing waste by the top ten US supermarket chains has recently been conducted [465]. Comparisons were made with Tesco in the UK, which was used as an exemplar. Tesco were commended for extending their food waste efforts throughout the supply chain, tracking and reporting on progress, and focusing on prevention and partnerships [465]. In comparison, all but one US supermarket, Ahold Delhaize, failed to transparently report food waste and only four had food waste reduction commitments [465].

The significant power of the world's largest supermarkets is likely to have many implications for public health. For example, Australian supermarkets were found to exert influence in three key domains, namely food governance (i.e. how rules or decisions about food are made), the food system (i.e. livelihoods and communities), and public health nutrition (i.e. determinants of health) [322]. Food environments including supermarkets have been identified as a driver of poor diet [7-9], which is one of the most important risk factors for early deaths globally [2]. However, public health-led interventions in supermarket settings can lead to increased purchases of healthy foods [18, 19]. They have the power to create food environments supportive of healthy food choices, which UK supermarkets have publicly acknowledged [157]. What is missing is an assessment of the CSR activity of the world's largest and most powerful supermarkets, to understand where progress is being made on protecting public health, and the improvements needed. Critique of supermarkets' CSR has the potential to stimulate change throughout the food system [466].

To date, there has not been a systematic analysis of global supermarket CSR commitments to protect public health. There is a significant gap in knowledge about how supermarkets address the global challenge of supporting and encouraging healthy

and sustainable diets. This study aimed to investigate publicly available CSR commitments that impact public health by the world's largest and most powerful supermarkets.

6.2.3 Methods

6.2.3.1 Study scope

The specific research question was: What public health related CSR commitments have been made by supermarket chains globally? This analysis focused on CSR commitments related to food and non-alcoholic beverages in the three domains of food governance, the food system, and public health nutrition. Food governance CSR commitments describe rules or decisions that impact the food system [62]. Food system CSR commitments impact the people whose livelihoods depend upon making food available, including farmers and food manufacturers, and their communities [61]. CSR commitments to public health nutrition impact the provision of safe, nutritious, affordable, secure, and environmentally sustainable food [65].

Supermarkets' CSR activity to reduce the environmental impact of buildings and distribution networks, and minimise harm from alcohol, tobacco, gambling, or other business interests were excluded. These initiatives are an important way for supermarkets to reduce their impact on people and the planet, but are beyond the scope of this review due to the focus on how supermarkets can support and encourage healthy and sustainable diets.

6.2.3.2 Selection of companies

INFORMAS, which aims to standardise food environments monitoring in diverse countries and settings [9], recommends focusing on predominant food outlet types [66]. Therefore, the focus of this study was commitments made by the largest supermarket chains worldwide to support and encourage healthy and sustainable diets.

The world's largest one hundred retailers (of all types) were identified using the 2018 *Global Powers of Retailing* report [339]. Compiled annually by auditor Deloitte, this report ranked retailers using publicly available information for the financial year ending in June 2017. The largest one hundred retailers comprised forty-four supermarket chains, hypermarket chains, and discount supermarket chains (referred to

simply as supermarkets henceforth), which were selected for this study. The Fortune 500 report was not used as the tool for selecting the world's largest supermarkets, as it only considers companies that are incorporated and operate in the US [467].

6.2.3.3 Data collection

Websites for each of the selected supermarkets were searched for company reports referring to CSR or sustainability. The GRI's Sustainability Disclosure Database (GRI database) [340] was also searched to identify whether reports had been lodged by the supermarkets, and whether they were in the recommended format (i.e. GRI-G4). Reports in languages other than English were excluded for practical reasons (13 reports). Corporate reports that referred to CSR or sustainability were identified. For each included supermarket, information about the dominant retail format (e.g. discount store, hypermarket), country of origin, annual retail revenue, the number of countries where they operate, and the number of supermarkets were recorded. Participation in the GRI database, and presence on the Fortune 500 list were also recorded. Supermarket reports referring to CSR or sustainability provided the research materials for this study.

Supermarket reports had a number of different names assigned by the corporations, including: global responsibility report, sustainability report, corporate responsibility report, annual activity and responsible commitment report, sustainable retailing performance, green mission report, and corporate citizenship report. In addition, CSR was referred to within some annual reports. Separate CSR commitments or strategies were published by some supermarkets, and these were included as research materials.

6.2.3.4 Theoretical framework applied

A framework was developed to analyse the CSR reports based on evidence of how supermarket power impacts public health [322] (Figure 6.1). For this study, content analysis of CSR reports identified themes relating to the following 14 attributes: general governance, influencing policy, setting supplier rules, influencing livelihoods, influencing communities, accessibility, availability, food cost and affordability, food preferences and choices, food safety and quality, nutritional quality, animal welfare, food and packaging waste, and other sustainability issues.

6.2.3.5 Data analysis

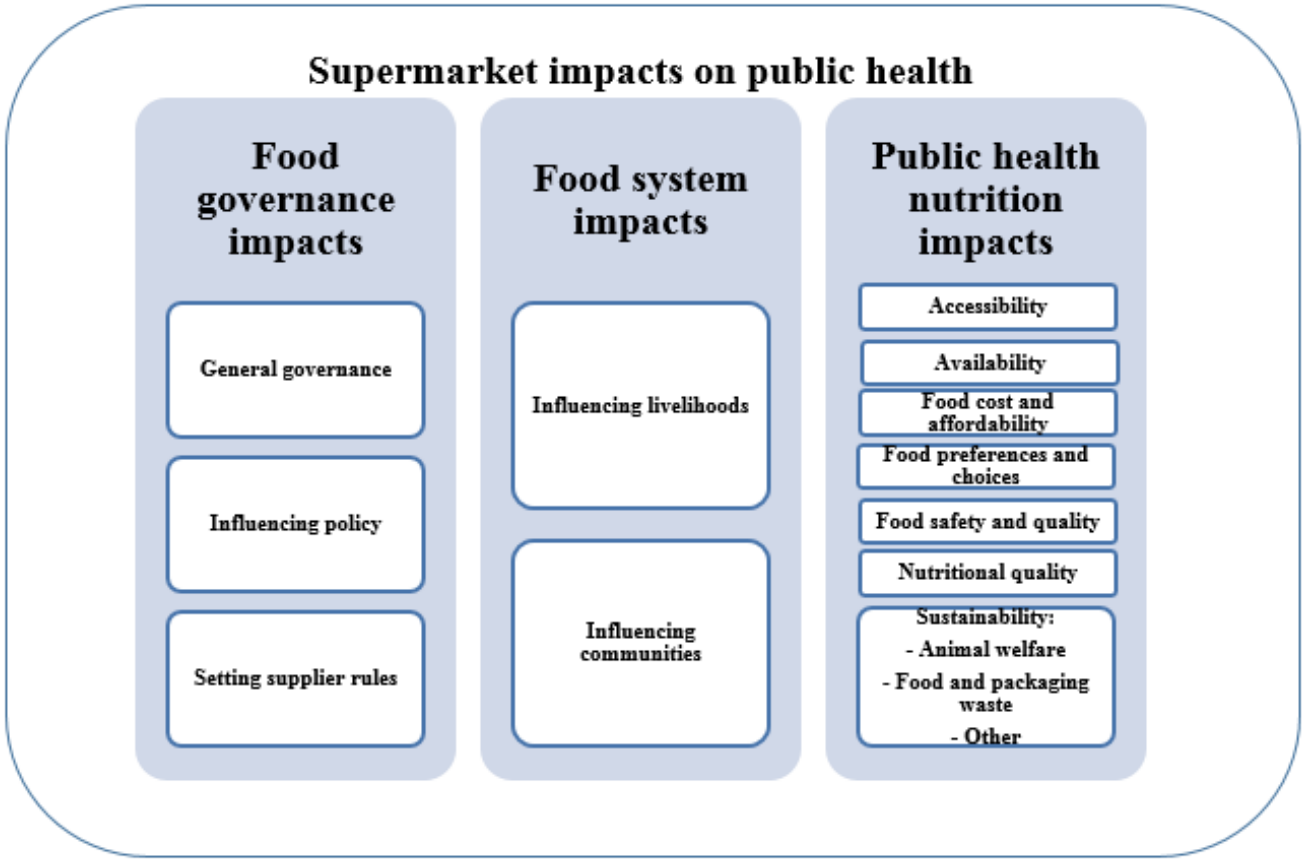
Supermarket reports were entered into NVivo11 and the first author reviewed them for content relating to the theoretical framework, with each segment of coded text referred to as a 'CSR statement'. The process included initial familiarisation with the reports, followed by coding selected text to the 14 attributes listed above. Each of the coded text segments was reviewed again for important themes.

6.2.4 Results

Thirty-one supermarkets met the inclusion criteria for this study, i.e. a supermarket listed in the top one hundred retailers (of all types) in the 2018 *Global Powers of Retailing* report [339], with a CSR or sustainability report available in English. The list includes five companies listed on the Fortune 500 list (Table 6.1). Supermarket countries of origin included Germany, France, the Netherlands, the UK, Switzerland, Spain, Italy, Sweden, Finland, the US, Canada, Australia, South Korea, Chile, South Africa, and Hong Kong. Six of the companies only operated in one country (the US, the UK or Canada) and the rest operated in between two and 50 countries. For example, US-based Walmart operated supermarkets in 27 countries including Argentina, Canada, Ghana, China, India, Japan, and Uganda; Netherlands-based Ahold Delhaize operated supermarkets in 11 countries including the US, Belgium, Greece, and Romania; South Korea-based Lotte Shopping operated supermarkets in six countries including China, Indonesia, and Russia. The number of supermarket outlets ranged from 245 (Hy-Vee Inc) to 6,548 (Dairy Farm International Holdings Ltd). Most (24/31) supermarkets participated in the GRI database, however only 12 reports were compliant with the GRI-G4 standard.

Supermarket CSR reports addressed 79 themes (listed 1-79 in Table 6.2) across the 14 attributes included in the theoretical framework (Figure 6.1). Most (57/79) themes related to public health nutrition, followed by food governance (10/79), and then food system (12/79) themes. Table 6.2 provides details of the CSR themes reported across all supermarkets. Table 6.3 summarises the CSR commitments made by each supermarket, cross-referenced with the themes reported in Table 6.2 that were included in the publicly available reports.

Figure 6.1 Framework of supermarket impacts on public health[#]



 # The framework is based on evidence of how supermarket power impacts public health [322]; it includes three domains and 14 attributes

Table 6.1 Summary of the world's largest supermarkets based on data sourced from *Global Powers of Retailing* [339]

FY2016 Retail revenue rank	Name of company	Dominant retail format	Country of origin	FY2016 Retail revenue (US$M)[a]	Number of countries	Number of supermarkets	Main supermarket chain(s)	Participate in the GRI Sustainability Disclosure Database[b]	Type of report (as per GRI database)	Fortune 500 company	Title of reviewed report (year), and website link for non-GRI reports
1	Wal-Mart Stores, Inc.	Hypermarket/ Supercentre/ Superstore	US	485,873	29	11,700	Walmart Sam's Club Massmart Asda	Yes	GRI-G4	#1	Global responsibility report (2017)
3	The Kroger Co.	Supermarket	US	115,337	1	2,796	Kroger Ralphs Dillons Smith's	Yes	Non-GRI	#18	Sustainability report (2017)
8	Aldi Einkauf GmbH & Co. oHG	Discount Store	Germany	84,923	17	10,132	Aldi	Yes	North: Non-GRI; South: GRI-G4	-	Aldi North Group: Sustainability report (2015), Aldi South Group: International corporate responsibility report (2015)
9	Carrefour S.A.	Hypermarket/ Supercentre/ Superstore	France	84,131	34	11,935	Carrefour Champion	Yes	GRI-G4	-	Annual activity and responsible commitment report (2016)
11	Tesco PLC	Hypermarket/ Supercentre/ Superstore	UK	72,390	8	6,809	Tesco	Yes	Non-GRI	-	Annual report and financial statements (2017), Little Helps Plan (2017)

FY2016 Retail revenue rank	Name of company	Dominant retail format	Country of origin	FY2016 Retail revenue (US$M)[a]	Number of countries	Number of supermarkets	Main supermarket chain(s)	Participate in the GRI Sustainability Disclosure Database[b]	Type of report (as per GRI database)	Fortune 500 company	Title of reviewed report (year), and website link for non-GRI reports
14	Ahold Delhaize	Supermarket	Netherlands	68,950	11	6,556	Delhaize Albert Heijn Food Lion Hannaford	Yes	GRI-G4	-	Supplementary report on sustainable retailing performance (2016), Annual report (2016)
17	Albertson's Companies, Inc.	Supermarket	US	59,678	1	2,300	Albertsons Safeway Tom Thumb	No	-	#49	Sustainability update (2016) https://www.albertsons.com/our-company/social-responsibility/
18	Auchan Holding SA	Hypermarket/ Supercentre/ Superstore	France	57,219	14	3,778	Auchan Jumbo Alcampo Simply Market	Yes	Non-GRI	-	CSR section of the 2016 management report (2016)
21	Wesfarmers Limited	Supermarket	Australia	47,690	4	801	Coles	Yes	GRI-G4	-	Sustainability report (2017)
22	Rewe Group	Supermarket	Germany	44,641	11	14,728	Rewe Penny Adeg	Yes	GRI-G4	-	Sustainability report (2015/16)
23	Woolworths Limited	Supermarket	Australia	40,773	3	1,179	Woolworths Countdown	Yes	GRI-G4	-	Corporate responsibility strategy 2020 (2017), Annual report (2017), Corporate social responsibility report (2017)

FY2016 Retail revenue rank	Name of company	Dominant retail format	Country of origin	FY2016 Retail revenue (US$M)[a]	Number of countries	Number of supermarkets	Main supermarket chain(s)	Participate in the GRI Sustainability Disclosure Database[b]	Type of report (as per GRI database)	Fortune 500 company	Title of reviewed report (year), and website link for non-GRI reports
24	Casino Guichard-Perrachon S.A.	Hypermarket/ Supercentre/ Superstore	France	39,856	27	12,969	Casino Franprix Leader Price Libertad Pão de Açúcar	No	-	-	Annual and corporate social responsibility performance report (2016) https://www.groupe-casino.fr/en/wp-content/uploads/sites/2/2017/06/RA-2016-GB.pdf
29	Publix Super Markets, Inc.	Supermarket	US	34,274	1	1,182	Publix	Yes	Non-GRI	#85	Sustainability report (2017)
30	Loblaw Companies Limited	Hypermarket/ Supercentre/ Superstore	Canada	34,235	6	2,300	Loblaws Zehrs Provigo	Yes	Non-GRI	-	Corporate social responsibility report (2016)
31	J Sainsbury plc	Supermarket	UK	34,048	2	1,200	Sainsbury's	Yes	Non-GRI	-	20x20 sustainability plan (2014), Annual report and financial statements (2017)
39	Migros-Genossenschafts Bund	Hypermarket/ Supercentre/ Superstore	Switzerland	24,152	3	685	Migros	Yes	GRI-G4	-	Annual report (2016)
40	Lotte Shopping Co., Ltd.	Hypermarket/ Supercentre/ Superstore	South Korea	23,991	6	886	Lotte Mart	Yes	GRI-G4	-	Annual report (2016), Sustainability report (2014)

FY2016 Retail revenue rank	Name of company	Dominant retail format	Country of origin	FY2016 Retail revenue (US$M)[a]	Number of countries	Number of supermarkets	Main supermarket chain(s)	Participate in the GRI Sustainability Disclosure Database[b]	Type of report (as per GRI database)	Fortune 500 company	Title of reviewed report (year), and website link for non-GRI reports
43	Coop Group	Supermarket	Switzerland	28,744	7	2,295	Coop Sapori d'Italia The Karma shop	Yes	Cites GRI	-	Sustainability progress report (2016)
47	Mercadona, S.A.	Supermarket	Spain	21,905	2	1,574	Mercadona	No	-	-	Satisfying "The Boss" Annual report (2015) https://info.mercadona.es/en/who-we-are/press-hall/annual-reports
48	Wm Morrison Supermarkets PLC	Supermarket	UK	21,744	1	491	Morrisons	Yes	Non-GRI	-	Corporate responsibility report (2016/17)
53	Empire Company Limited	Supermarket	Canada	18,065	1	1,500	Sobeys	No	-	-	Annual report (2016) https://www.empireco.ca/wp-content/uploads/2017/03/Empire-AR-2016_ENG-FINAL-SEDAR.pdf
59	Whole Foods Market, Inc.	Supermarket	US	15,724	3	481	Whole Foods Market	Yes	Non-GRI	#176	Green mission report (2012)

FY2016 Retail revenue rank	Name of company	Dominant retail format	Country of origin	FY2016 Retail revenue (US$M)[a]	Number of countries	Number of supermarkets	Main supermarket chain(s)	Participate in the GRI Sustainability Disclosure Database[b]	Type of report (as per GRI database)	Fortune 500 company	Title of reviewed report (year), and website link for non-GRI reports
64	Cencosud S.A.	Supermarket	Chile	14,525	5	384	Jumbo Gbarbosa Santa Isabel Wong Metro	Yes	Non-GRI	-	Annual memory (2016)
67	Marks and Spencer Group plc	Department store/ Supermarket	UK	13,837	50	1,025	Marks and Spencer	Yes	GRI-G4	-	Plan A report (2017), Plan A 2025 commitments (2017)
70	John Lewis Partnership plc	Department store/ Supermarket	UK	13,361	6	352	Waitrose	Yes	Non-GRI	-	Sustainability report (2016), Annual report and accounts (2017)
78	Conad Consorzio Nazionale, Dettaglianti Soc. Coop. a.r.l.	Supermarket	Italy	12,345	2	2,673	Conad Margherita Todis Sapori & Dintorni	No	-	-	Annual report (2015) https://en.calameo.com/read/001456897077b0490e97a
80	ICA Gruppen AB	Supermarket	Sweden	11,824	5	1,300	ICA Rimi	Yes	GRI-G4	-	Sustainability report: Jan-March, Apr-June, Jul-Sept (2017), Annual report (2017)

FY2016 Retail revenue rank	Name of company	Dominant retail format	Country of origin	FY2016 Retail revenue (US$M)[a]	Number of countries	Number of supermarkets	Main supermarket chain(s)	Participate in the GRI Sustainability Disclosure Database[b]	Type of report (as per GRI database)	Fortune 500 company	Title of reviewed report (year), and website link for non-GRI reports
85	Dairy Farm International Holdings Limited	Supermarket	Hong Kong	11,201	11	6,548	Wellcome Yonghui Cold Storage Jasons Marketplace Giant	No	-	-	Annual report (2016) https://www.dairyfarmgroup.com/en-US/Investors/Financial-Reports
88	S Group	Supermarket	Finland	10,835	5	1,633	S Market Prisma Alepa Sale	Yes	GRI-G4	-	Responsibility report (2016)
94	Shoprite Holdings Ltd.	Supermarket	South Africa	10,340	15	2,689	Shoprite Usave Checkers	Yes	Non-GRI	-	Integrated report (2017)
99	Hy-Vee, Inc.	Supermarket	US	9,800	1	245	Hy-Vee	No	-	-	Corporate citizenship report (2017) https://www.hy-vee.com/corporate/our-company/corporate-citizenship-report

Table 6.2 Thematic analysis of supermarket corporate social responsibility commitments that impact public health

Food governance						
General governance	(1) Participates in global governance initiatives, e.g. GRI database, Dow Jones Sustainability Index, Global Compact	(2) Aims to improve population nutrition and health	(3) Upholds ethical practice by a code of conduct or similar			
Influencing policy	(4) Participates in government-led public health nutrition initiatives	(5) Works with key influencers on setting food, nutrition, or sustainability standards and policies	(6) Is transparent about relationships including with external groups, and own brand suppliers			
Setting rules for suppliers	(7) Requires third party quality accreditation, e.g. Global Gap	(8) Sets standards for producers of supermarket own brand products	(9) Sets other private standards for suppliers	(10) Sets rules for social and environmental issues		
Food system						
Influencing livelihoods	(11) Sources local food products	(12) Pays food producers a fair price and/or has fair payment terms	(13) Pays staff a fair wage, and/or provides healthy working conditions	(14) Deals with suppliers in an ethical way	(15) Provides financial assistance e.g. loans, or training to small/ local businesses	(16) Promotes local or regional foods in other countries

Influencing communities	(17) Highlights charitable food donations made	(18) Makes food donations for animals	(19) Provides other support to food charities e.g. infrastructure, training	(20) Supports community organisations via provision of space and other resources	(21) Provides community support via funding specific food and nutrition projects	(22) Provides emergency aid to communities or staff affected by natural disasters	
Public health nutrition							
Accessibility	(23) Considers the location of stores in communities	(24) Considers the location of foods in stores e.g. removes unhealthy foods from prominent locations	(25) Provides consumer education initiatives to support healthy eating, e.g. store tours, menu planning, cooking skills	(26) Provides consumer education initiatives related to sustainability, e.g. ways to reduce food waste, animal welfare information	(27) Has promotions to encourage sales of healthy foods	(28) Increases accessibility of supermarket own brands by making them available to other retailers or other countries	
Availability	(29) Sells healthy foods	(30) Sells sustainable foods	(31) Sells locally sourced or regional foods	(32) Sells fresh food	(33) Sells products to meet specific needs	(34) Sells supermarket own brand products	(35) Sells convenient products
Food cost and affordability	(36) Offers foods that are affordable	(37) Ensures healthy foods are no more expensive than unhealthy foods	(38) Tracks shopping basket affordability via ongoing monitoring	(39) Offers foods that meet specific needs at a competitive price	(40) Keeps the cost of supermarket own brand products down	(41) Offers discounts or subsidies on healthy foods, or other foods that meet specific needs	
Food preferences and choices	(42) Has food labelling initiatives to enable consumers to identify healthy and/or sustainable foods	(43) Has food labelling initiatives to enable consumers to identify foods that meet specific needs, e.g. free from, vegetarian	(44) Has food labelling/ marketing initiatives to identify locally sourced or regional products, e.g. logos, catalogues	(45) Has food labelling/ marketing initiatives related to animal welfare	(46) Highlights healthier food choices using in-store signage e.g. shelf edge labels	(47) Highlights healthier food choices on shopping websites	(48) Highlights sustainability messages e.g. minimise food waste, recycle food packaging

Food safety and quality	(49) Makes food safety statements	(50) Makes statements about food quality	(51) Emphasises traceability	(52) Ensures hygienic stores	(53) Avoids use of artificial ingredients, e.g. colours, flavours, preservatives, BPA-free packaging	(54) Avoids use of genetically modified ingredients	
Public health nutrition (continued)							
Nutritional quality	(55) Has a nutrient reduction programme for supermarket own brand foods	(56) Has specific healthy food ranges	(57) Has established targets for healthy foods to contribute a significant proportion of total food sales	(58) Has established targets to improve the overall nutritional profile of foods sold	(59) Has established targets to reduce portion sizes of single serve snacks		
Sustainability - animal welfare	(60) Encourages sustainable fishing practices	(61) Minimises use of hormones or antibiotics	(62) Upholds the five freedoms of animals to ensure their welfare	(63) Sells cage-free eggs	(64) Sets standards for dairy cow welfare	(65) Has other initiatives to improve animal welfare	(66) Bans products from sale due to animal welfare concerns
Sustainability - food and packaging waste	(67) Has established targets to reduce food waste	(68) Sells imperfect fresh produce, or uses it to make meals or products	(69) Has established targets to reduce waste in the whole of the food system	(70) Has established targets to reduce and recycle packaging waste	(71) Sources packaging materials from sustainably managed forests	(72) Has established targets to reduce waste by moving paper-based marketing materials e.g. coupons, to digital formats	
Sustainability - other	(73) Sustainably sources coffee	(74) Sustainably sources cocoa	(75) Sustainably sources palm oil	(76) Sustainably sources soy	(77) Sustainably sources other ingredients	(78) Sources organic products	(79) Has other product related sustainability commitments

Table 6.3 Summary of the world's largest supermarkets' corporate social responsibility commitments that impact public health

Name of company	Food governance	Food system	Public health nutrition						
			Accessibility	Availability	Food cost and affordability	Food preferences	Food safety and quality	Nutritional quality	Sustainability
Wal-Mart Stores, Inc. (n=37)	2, 4, 5, 9, 10	11, 13, 15, 17, 19, 22	23, 25, 26	-	36, 41	42, 47	49, 51, 53	55, 56	60, 61, 62, 63, 64, 65, 67, 68, 69, 70, 75, 76, 77, 79
The Kroger Co. (n=35)	1, 2, 3, 4, 5, 6, 8, 9, 10	11, 13, 14, 17, 22	-	33, 34	-	43, 44, 45	49, 50, 52, 53	-	60, 61, 63, 64, 65, 66, 67, 70, 72, 73, 75, 79
Aldi Einkauf GmbH & Co. oHG (n=29)	7, 9	11, 13, 17, 21	24, 25, 26	32, 33, 34	-	42, 43, 44, 45	50, 53, 54	55	60, 62, 65, 66, 70, 73, 74, 75, 79
Carrefour S.A. (n=30)	1, 2, 8	11, 12, 17, 19, 21, 22	23, 27, 28	31, 33, 34, 35	36, 39, 40	43	49, 50, 51	-	60, 61, 67, 69, 75, 77, 79
Tesco PLC (n=29)	1, 2	12, 13, 17, 20, 21	24	34	36, 37, 40, 41	46, 47	49	55, 58	60, 64, 65, 67, 68, 69, 70, 74, 75, 77, 79
Ahold Delhaize (n=31)	1, 2, 3, 7, 8	13, 17, 18	25	33, 34	36	42, 43, 45, 46	49, 50	55, 57	60, 64, 66, 67, 68, 69, 73,74, 75, 76, 77
Albertson's Companies, Inc. (n=6)	-	17, 22	25	34	-	-	-	-	70, 75
Auchan Holding SA (n=29)	1	11, 13, 15, 16, 17, 18, 19, 20, 21	24, 25, 27	29, 33, 34	36	42, 43, 45	49, 51, 52, 54	-	60, 67, 70, 75, 79
Wesfarmers Limited (n=28)	1, 4, 8, 9	11, 12, 13, 15, 17, 22	-	32	36	42	49, 51, 53	55	60, 62, 63, 65, 67, 68, 70, 73, 74, 75, 77
Rewe Group (n=34)	1, 3, 5, 8, 9	13, 17	25	30, 21, 33, 34	-	42, 43, 44, 45, 47	49, 50	-	60, 62, 63, 64, 65, 66, 67, 68, 70, 74, 75, 76, 77, 78, 79

Name of company	Food governance	Food system	Public health nutrition						
			Accessibility	Availability	Food cost and affordability	Food preferences	Food safety and quality	Nutritional quality	Sustainability
Woolworths Limited (n=32)	1, 4, 7, 8, 9, 10	11, 14, 17, 21, 22	24	-	36, 38	42, 45, 47, 48	53	55	60, 63, 64, 65, 67, 68, 69, 70, 73, 74, 75, 77
Casino Guichard-Perrachon S.A. (n=30)	2, 3, 7, 8	11, 12, 17	23, 25, 28	33, 34	36, 39, 40, 41	44	49	55, 57	60, 61, 63, 64, 65, 68, 70, 75, 77, 79
Publix Super Markets, Inc. (n=12)	3	13, 17, 18	-	34	-	46	-	-	60, 61, 62, 65, 67, 70
Loblaw Companies Limited (n=22)	2, 5	17, 19, 22	25	33, 34	-	46, 47	49, 51	-	60, 61, 63, 64, 65, 68, 70, 74, 75, 77
J Sainsbury plc (n=25)	2, 3, 10	11, 13, 17, 18	25	33, 34	36	42, 43, 47	-	55, 56, 57	61, 63, 65, 67, 69, 70, 75, 77
Migros-Genossenschafts Bund (n=24)	2, 7, 8	13, 17, 23	25	33	-	42, 43, 44	49	55	60, 65, 66, 67, 70, 73, 74, 75, 76, 77, 79
Lotte Shopping Co., Ltd. (n=16)	1, 3, 9	11, 12, 13, 15, 21	-	-	41	44	49, 51, 52	-	67, 70, 72
Coop Group (n=26)	1, 7, 8, 9	17, 22	23, 26	30, 31, 33, 34	-	44, 45	51	-	60, 63, 64, 65, 70, 73, 74, 75, 76, 77, 79
Mercadona, S.A. (n=13)	1, 4, 5	11, 12, 13, 17	-	33, 34	36	-	49	-	68, 79
Wm Morrison Supermarkets PLC (n=28)	2, 3, 4, 5, 8, 9	12, 14, 17, 20	-	-	41	42, 43, 46, 47	49	55, 56, 57	60, 61, 63, 67, 68, 69, 70, 75, 76
Empire Company Limited (n=19)	-	11, 17, 19, 21	24, 25	33, 34	36	45	49	-	63, 65, 67, 68, 69, 70, 77, 79
Whole Foods Market, Inc. (n=22)	8, 10	15, 17, 20, 21	25	29, 33	-	43, 45	50, 54	-	60, 61, 62, 65, 67, 70, 73, 78
Cencosud S.A. (n=10)	1, 3, 6, 9, 10	11, 13, 14, 17	-	-	-	44	-	-	-

Name of company	Food governance	Food system	Public health nutrition						
			Accessibility	Availability	Food cost and affordability	Food preferences	Food safety and quality	Nutritional quality	Sustainability
Marks and Spencer Group plc (n=26)	1, 5, 8, 9, 10	13, 17, 20, 21	24	33	41	-	53	56, 57, 58, 59	60, 67, 70, 73, 74, 75, 76, 77, 79
John Lewis Partnership plc (n=17)	3, 7, 8	11, 12, 13, 17, 18	25, 28	34	-	-	49	55	60, 64, 75, 76
Conad Consorzio Nazionale, Dettaglianti Soc. Coop. a.r.l. (n=18)	8	11, 12, 16, 17	25	31, 33, 34	36, 39	43, 44, 46	49, 54	-	71, 79
ICA Gruppen AB (n=31)	1, 2, 3, 4, 5, 8, 9	11, 13, 17, 21	25, 26	29, 30, 31, 34, 35	36	42	49, 50, 52	-	62, 65, 67, 68, 69, 70, 75, 79
Dairy Farm International Holdings Limited (n=4)	-	17	-	34, 35	-	-	49	-	-
S Group (n=14)	2, 3, 5	13, 17	27	30, 32, 33	36	-	-	-	60, 67, 73, 75
Shoprite Holdings Ltd. (n=17)	8, 9	11, 13, 15, 17, 20, 21, 22	-	29, 34	36, 41	-	49, 52	-	67, 70
Hy-Vee, Inc.(n=5)	-	13	-	-	-	42	-	-	60, 67, 68

Footnote: (1) Participate in global governance initiatives; (2) Aim to improve population nutrition and health; (3) Uphold ethical practice by a code of conduct or similar; (4) Participate in government-led public health nutrition initiatives; (5) Work with key influencers on setting food, nutrition, or sustainability standards and policies; (6) Be transparent about relationships including with external groups, and own brand suppliers; (7) Requires third party quality accreditation; (8) Sets standards for producers of supermarket own brand products; (9) Sets other private standards for suppliers; (10) Set rules for social and environmental issues; (11) Sources local food products; (12) Pays food producers a fair price and/or has fair payment terms; (13) Pays staff a fair wage, and/or provides healthy working conditions; (14) Deals with suppliers in an ethical way; (15) Provides financial assistance or training to small/ local businesses; (16) Promotes local or regional foods in other countries; (17) Highlights charitable food donations made; (18) Makes food donations for animals; (19) Provides other support to food charities; (20) Supports community organisations via provision of space and other resources; (21) Provides community support via funding specific food and nutrition projects; (22) Provides emergency aid to communities or staff affected by natural disasters; (23) Location of stores in communities; (24) Location of foods in stores; (25) Consumer education initiatives on healthy eating; (26) Consumer education initiatives related to sustainability; (27) Promotions to encourage sales of healthy foods; (28) Increases accessibility of supermarket own brands by making them available to other retailers or other countries; (29) Availability of healthy foods; (30) Availability of sustainable foods; (31) Availability of locally sourced or regional foods; (32) Availability of fresh food; (33) Availability of products to meet specific needs; (34) Availability of supermarket own brand products; (35) Availability of convenient products; (36) Offers foods that are affordable; (37) Ensures healthy foods are no more expensive than unhealthy foods; (38) Tracks shopping basket affordability via ongoing monitoring; (39) Offers foods that meet specific needs at a competitive price; (40) Keeps the cost of

supermarket own brand products down; (41) Offers discounts or subsidies on healthy foods, or other foods that meet specific needs; (42) Food labelling initiatives to enable consumers to identify healthy and/or sustainable foods; (43) Food labelling initiatives to enable consumers to identify foods that meet specific needs; (44) Food labelling/ marketing initiatives to identify locally sourced or regional products; (45) Food labelling/ marketing initiatives related to animal welfare; (46) Highlights healthier food choices using in-store signage; (47) Highlights healthier food choices on shopping websites; (48) Highlights sustainability messages; (49) Makes food product safety statements; (50) Makes statements about food quality; (51) Emphasises traceability; (52) Ensures hygienic stores; (53) Avoids use of artificial ingredients; (54) Avoids use of genetically modified ingredients; (55) Has a nutrient reduction programme for supermarket own brand foods; (56) Sells healthy food ranges; (57) Established targets for healthy foods to contribute a significant proportion of total food sales; (58) Established targets to improve the overall nutritional profile of foods sold; (59) Established targets to reduce portion size of single serve snacks; (60) Encourages sustainable fishing practices; (61) Minimises use of hormones or antibiotics; (62) Upholds the five freedoms of animals to ensure their welfare; (63) Sells cage-free eggs; (64) Sets standards for dairy cow welfare; (65) Other initiatives to improve animal welfare; (66) Bans products from sale due to animal welfare concerns; (67) Established targets to reduce food waste; (68) Sells imperfect fresh produce, or uses it to make meals or products; (69) Established targets to reduce waste in the whole of the food system; (70) Established targets to reduce and recycle packaging waste; (71) Sources packaging materials from sustainably managed forests; (72) Established targets to reduce waste by moving paper-based marketing materials; (73) Sustainably sources coffee; (74) Sustainably sources cocoa; (75) Sustainably sources palm oil; (76) Sustainably sources soy; (77) Sustainably sources other ingredients; (78) Sources organics; (79) Other product related sustainability commitments.

The following results highlight common and less common CSR themes identified. For each key domain, an example of a supermarket CSR commitment is given.

6.2.4.1 Food governance

The food governance related theme most commonly reported by the supermarkets referred to setting standards for manufacturers of supermarket own brand products (15/99 food governance CSR statements). For example, Wm Morrison Supermarkets Plc required all own brand suppliers to adhere to their policy of meeting salt targets. Eight supermarkets also set standards for suppliers' social and environmental performance, including The Kroger Co. which required all suppliers to agree to the vendor code of conduct. The Kroger Co. assessed the risk of human rights violations in the supply chain, and conducted audits for compliance with the code requirements that included child and forced labour, discrimination, environment, ethics, freedom of association, health and safety, subcontracting, working hours and compensation.

Commitments to improving nutrition and health were only stated in reports from 12 supermarkets. Seven supermarkets made statements about working with government to develop and implement public health initiatives, including Australian companies Wesfarmers Ltd and Woolworths Ltd who referred to membership of the Healthy Food Partnership, a public-private-partnership initiative led by the Australian government [442].

6.2.4.2 Food system

Highlighting charitable food donations was the most commonly reported commitment that impacts the food system, made by all supermarkets apart from Hy-Vee Inc. and Lotte Shopping Co. Ltd (29/124 food system CSR statements). Supermarkets positioned donation of food not suitable for sale (but safe for consumption) as responsible management of food waste. French supermarkets referred to the country's legal requirement to donate surplus food (see [123]). American supermarkets referred to the Environmental Protection Agency's food recovery hierarchy that prioritises feeding hungry people (see [468]). Supermarkets aimed to assist in reducing hunger, and 'success' was often measured by the number of meals provided through a supermarket's contributions. Shoprite Holdings Ltd operated mobile soup kitchens in addition to making charitable food donations. However, Conad Consorzio Nazionale

point out *"Large retail welfare must not and cannot replace the role of institutions, which are in charge of putting solid measures in place to ensure those on low incomes have sufficient food."*

Six supermarkets supported local charities by providing space and other resources. Tesco Plc made 56 community rooms available for classes and meetings across their UK network of stores. Many Whole Foods Market Inc. stores provided space for farmers markets or served as pick-up locations for community supported agriculture schemes.

Seventeen supermarkets mentioned fair payment for employees. Some referred to exceeding national minimum wages (e.g. J Sainsbury, John Lewis Partnership Plc), whilst others referred to allowing labour representation and collective bargaining (e.g. Shoprite Holdings Ltd, Mercadona SA). Some supermarkets described the efforts they made to support the health and wellbeing of employees.

Although nine supermarkets committed to paying food producers a fair price or fair payment terms, only four supermarkets referred to dealing with suppliers in an ethical way. For example, Wm Morrison Supermarkets Plc and Woolworths Ltd both referred to membership of the Supplier Ethical Data Exchange which is a web-based system used to share ethical information and reduce auditing requirements for suppliers.

6.2.4.3 Public health nutrition

Public health nutrition commitments varied considerably across the supermarkets. Sustainable sourcing initiatives relating to ingredient sourcing (80 CSR statements), animal welfare (79 CSR statements), and reduction of food and packaging waste (69 CSR statements) were most commonly referred to. Nutritional quality (23 CSR statements), food cost and affordability (30 CSR statements), accessibility (35 CSR statements), and food preferences (55 CSR statements) were referred to the least.

Accessibility

Consumer education initiatives on healthy eating was most popular theme within accessibility, with fifteen supermarkets making commitments (15/35 accessibility CSR statements). For example, Casino Guichard-Perrachon SA had a Responsible Food truck which provided free cooking workshops using recipes to promote a healthy

and sustainable diet; and Loblaw Companies Ltd focused on educating children on how to read food labels and use the Guiding Stars nutrition rating system.

Four supermarkets described consumer education initiatives related to sustainability. For example, Wal-Mart Stores Inc.'s Asda supermarkets in the UK gave consumers advice on food storage and recipes ideas for leftovers, in an effort to reduce food waste.

Availability

Twenty supermarkets referred to own brand product availability (20/56 availability CSR statements). The magnitude of some own brand ranges was described, including the organic own brand range from Alberton's Companies Inc. which was the largest available in the USA. Aldi, which is well known for its focus on own brand products, stated the highest proportion was found in the Belgian and Luxemburg stores at 99.7 percent. Tesco Plc had developed 2,422 supermarket own brand products over the year.

In contrast, only four supermarkets made statements about healthy foods available in their stores, and four supermarkets made statements about sustainable foods. Three supermarkets made statements about available fresh foods.

Food cost and affordability

Fifteen supermarkets committed to offering foods that were affordable, the most common commitment within food cost and affordability (15/30 food cost CSR statements). For example, Ahold Delhaize stated *"We want every family in our trading areas to be able to do their weekly shopping with one of our [stores], regardless of their budget, so every supermarket continues to make pricing more competitive."* Other efforts included Auchan Holding SA's Russian stores' commitment to sell some fruits and vegetables below market price so they were affordable to all shoppers. S Group described their commitment to lowering prices as a long-term strategic decision to make shopping affordable. Shoprite Holdings Ltd described the importance of helping to put food on the table, and said affordability was a key measure of their success.

Three supermarkets committed to offering specific foods at competitive prices. For example, Carrefour SA in Argentina guaranteed the lowest prices for 800 products

every day. In addition, three supermarkets made statements about keeping the cost of supermarket own brand products down. Tesco Plc was the only supermarket chain to make a commitment to ensure shoppers always paid the same price or less for healthier options. Woolworths Ltd was the only supermarket chain to commit to introducing an affordable healthy eating index based on shopper preferences.

Food preferences and choices

Statements about food labelling initiatives to enable consumers to identify healthy or sustainable foods were made by twelve supermarkets (12/55 food preferences CSR statements). Seven made statements about assisting consumers to select healthy foods, and five referred to an aspect of sustainability. For example, Australian companies Wesfarmers Ltd and Woolworths Ltd had introduced the voluntary Health Star Rating front-of-pack nutrition labelling device on own brand products.

Six supermarkets highlighted healthier food choices in stores using signage: Ahold Delhaize and Loblaw Companies Ltd used the Guiding Stars system of rating all products available within a store and applied labels on grocery shelves to indicate the healthier choices; and Tesco Plc held a 'Little Helps to Healthier Living' event which included 'Helpful Little Swaps' signs to highlight products lower in sugar, fat or salt compared to regular alternatives. Products with the 'Helpful Little Swap' signs saw a 30 percent increase in sales during the event.

Seven supermarkets stated they highlighted healthier choices on their shopping websites: Tesco Plc used the 'Helpful Little Swaps' campaign; J Sainsbury's swapping campaign identified lower calorie options; Loblaw Companies Ltd applied the Guiding Stars system; and Wm Morrison Supermarkets Plc had a dedicated healthier living section which included healthier products.

With the exception of the Australian Health Star Rating algorithm which is publicly available, none of the supermarkets provided the criteria used to determine healthy and sustainable foods identified via product labelling, in-store signs, or websites.

Food safety and quality

Statements about the importance of food safety were made by twenty supermarkets, with seven making specific traceability commitments (20/49 food safety CSR

statements). Most statements referred to the rigorous processes in place to ensure suppliers of supermarket own brand products adhered to the supermarket's requirements for quality control. Some committed to ensuring all suppliers were compliant with requirements for food safety and correctly labelled products. Third-party assurances were often required from suppliers to demonstrate suitable standards were in place.

Nutritional quality

Few supermarkets made commitments to nutritional quality (12/31). Eleven supermarkets committed to nutrient reduction programmes for own brand products (11/23 nutritional quality CSR statements). Targeted nutrients included fat, saturated fat, salt or sodium, sugar, and added sugar, with sugar and sodium receiving the most attention. In addition, Migros-Genossenschafts Bund aimed to increase the fibre content of own brand products. Specific nutrient targets were not provided, with percent reduction, or total amount removed provided by some supermarkets.

Four supermarkets referred to healthy own brand ranges: J Sainsbury's 'My Goodness!' range; Marks and Spencer Group Plc's 'Count on Us' and 'Balanced for You' ranges; Wal-Mart Stores Inc's 'Great for You' range; and Wm Morrison Supermarkets Plc's 'Eat Smart' range. Criteria used to determine product healthiness were not disclosed.

Four supermarkets committed to healthy supermarket own brand foods contributing a significant proportion of total food sales. Marks and Spencer Group Plc and J Sainsbury Plc set targets for the contribution of all healthy foods (not just own brand) to total food sales. Criteria used to define healthy foods were not provided.

Sustainable sourcing

Commitments to sustainable fishing were made by 22 supermarkets (22/79 animal welfare CSR statements). For example, the sustainable fishing policies of Auchan Holding SA and Aldi Einkauf GmbH & Co. oHG referred to not stocking species that were categorised as endangered or protected. Some supermarkets referred to third party schemes for ensuring the sustainability of the own brand fish sold in their stores, including the Sustainable Fisheries Partnership, Marine Stewardship Council, Aquaculture Stewardship Council, RSPCA Freedom Food, Seafish Responsible

Fishing Scheme, WWF Seafood Group, International Seafood Sustainability Foundation, and Sustainable Seafood Coalition.

Commitments to reduce food waste were made by 22 supermarkets (22/69 food and packaging waste CSR statements). Three supermarkets, Ahold Delhaize, J Sainsbury Plc and Tesco Plc, committed to transparently reporting food waste. Tesco Plc had taken this a step further by making a joint commitment with 24 of their largest suppliers to reduce overall food waste across the supply chain. Other food waste reduction initiatives included a partnership between ICA Gruppen AB in Sweden and Karma, a food application, to trial selling food products near their best before date at reduced prices. J Sainsbury replaced multi-buy promotions with lower regular prices to reduce bulk purchasing, which often resulted in wasted food at home. US supermarkets referred to the Environmental Protection Agency's food recovery hierarchy which prioritises source reduction, followed by feed hungry people, feed animals, industrial uses, composting, with landfill or incineration at the bottom (see [468]).

Supermarket commitments to sustainably sourcing products related to own brand products. Standards referred to include the Roundtable on Sustainable Palm Oil, UTZ Certified, Rainforest Alliance, Fairtrade USA, Fairtrade International, and Bio Suisse. Sustainable sourcing of palm oil was referred to the most, by 21 supermarkets (21/80 sustainable sourcing CSR statements). Ten supermarkets committed to sourcing coffee sustainably. Ten supermarkets referred to sustainably sourcing cocoa, although often this was for specific own brand ranges and did not apply to all products. Eight supermarkets referred to sustainably sourcing soy, which was widely used for animal feed. Fourteen supermarkets referred to sustainably sourcing other ingredients including tea, beef, rice, bananas, fruit juice, hazelnuts, and sugar. Three supermarkets made commitments to sourcing organic products.

6.2.5 Discussion

Publicly available CSR commitments made by 31 of the world's largest and most powerful supermarkets included 79 themes, identified using a theoretical framework developed by Pulker *et al.* (2018) to demonstrate how supermarket power impacts public health [322]. Some CSR commitments from some supermarkets indicate they have potential to positively impact public health, but supermarket CSR efforts were generally disappointing.

Although a large number of themes were identified, and there were differences between each business, supermarket CSR commitments consistently focused on the same five priorities. Supermarkets' efforts to demonstrate good corporate citizenship focused on: (1) donating surplus food to charities for redistribution to feed the hungry; (2) reducing and recovering food waste; (3) sustainably sourcing ingredients including seafood, palm oil, soy and cocoa including via third-party accreditation; (4) governance of food safety including via third-party accreditation; and (5) growing the number of own brand foods available, that are made by suppliers to meet supermarkets' requirements. These priority themes are described below with real world examples from global supermarkets.

6.2.5.1 Donating surplus food to charities for redistribution to feed the hungry

Food charities, such as food banks, provide emergency food relief to people who would otherwise go hungry, and have proliferated in many high-income countries in response to increased food insecurity [469]. To date there is little evidence that charitable food redistribution of unsalable food is an appropriate response for recipients, and researchers challenge the food bank model as a long-term strategy [470]. Concerns have been raised about the 'industry' of food banking, described as a business solution that delivers food system efficiency by removing the need for costly landfill [471].

Food donations are essential to food banks, but due to the variability of donated foods nutritional quality cannot be guaranteed [469]. Countries relying on food donations to charities for redistribution to address hunger do not meet human rights obligations, specifically that everyone, regardless of income, has the right to select nutritious and appropriate food in socially acceptable ways [472]. Ironically, many supermarket employees in the US have been found to rely on food assistance such as the Supplemental Nutrition Assistance Program due to low wages, and lack of health care and child care cover [466]. This clearly raises a challenge for supermarkets to provide fair and liveable wages [466].

The powerful supermarkets in this study have reinforced discourse that entwines responsible management of food waste with feeding the hungry. However, charitable food redistribution does not address the underlying structural causes of food insecurity which include poverty, and may even increase inequality [470, 473]. It has been argued

that whilst supermarkets continue to support food charities to feed the hungry, governments will not make the social policy reforms needed to ensure citizens' rights to food are protected [474]. Italy based Conad Consorzio Nazionale were the only supermarket to state that it was the responsibility of the state to support those on low incomes to have sufficient food. Supermarket CSR efforts to feed the hungry should not replace the need for governments to protect the human right to food.

6.2.5.2 Reducing and recovering food waste

Food waste is a significant global problem, described as a structural symptom of the 'broken globalised food system' [474] (p83). Globally, a third of the food produced is never eaten [475]. Food is wasted throughout the global food system, including from growers, processors, manufacturers, distributors, retailers, food service operators, and end consumers [476]. For example, a UK study showed that most (70 percent) losses occurred in the home [472].

The World Resources Institute provides companies with guidance on food loss and waste reporting [477]. Committing to reduce food waste throughout the whole of the food system forces supermarkets to address their own practices which contribute to generating waste. These practices include setting cosmetic standards for fresh produce that mean imperfect looking produce is discarded [123]; providing inappropriate packaging formats (e.g. oversized) [478]; encouraging increased food purchases with offers such as 'buy one get one free' [479]; or labelling foods with 'best before' dates to indicate optimal product quality not required by food regulations [472].

Tesco Plc have been commended for their actions on transparently reporting food waste [465]. They have reported waste profiles for the most commonly purchased foods, including levels and causes, to create tailored waste reduction plans [480]. Recently, they announced removing best before dates from packaging [481]. Only two other supermarkets have committed to transparently reporting food waste, so there is much room for improvement in the scale and impact of global supermarket food waste reduction efforts. Working on solutions that encompass the whole of the food system rather than passing the problem onto other actors is essential [123].

6.2.5.3 Sustainable sourcing

Supermarkets in this study consistently framed sustainably sourcing ingredients as the primary method to address sustainable food systems. This included consideration of animal welfare, social, and environmental impacts. Analysis of global food manufacturers found that such sustainable sourcing initiatives overlooked the most important factor, that is how to achieve healthy and sustainable diets [482].

Australian research has evaluated the environmental impact of 'discretionary' foods, which are not essential for a healthy diet [3, 483], recommending a reduction in production and consumption as a priority, along with meat reduction, to improve the sustainability of the food system [483]. Discretionary foods are more likely to be 'ultra-processed' [108] nutrient-poor industrially processed foods [67]. Dietary guidelines incorporating principles of sustainability recommend avoiding these ultra-processed foods [74].

Although not included in the CSR report, ICA Gruppen in Sweden has taken action to encourage consumers to reduce meat consumption and eat more vegetarian food instead [484]. Supermarkets wishing to make meaningful CSR commitments to support sustainable diets could start by recognising the importance of reducing production and consumption of discretionary foods, meat, and other ingredients with high social and environmental impacts, rather than encouraging ongoing growth from third-party accredited 'sustainable' sources.

6.2.5.4 Private governance of food safety

The neoliberal political context that minimises regulations in order to promote free trade allows supermarkets to privately govern the food system [322]. The ability to set so called 'voluntary' standards for suppliers that must be met is a source of supermarket power that enables control of the supply base [258]. On the other hand however, a major benefit of supermarket private food safety standards is an increasingly safe food supply [322]. Most of the supermarkets in this study focused on assuring safe, correctly labelled foods from all suppliers.

6.2.5.5 Growth of supermarket own brand foods

Supermarkets have extended their control over the food system by introducing supermarket own brands. Own brand products offer supermarkets practical benefits,

such as flexible global sourcing [249], particularly for shelf-stable processed foods. They can enforce private standards for own brands to manage risk by controlling products, processes, and movement through the supply chain [264]. Globally, market share of supermarket own brands is predicted to grow until they dominate the food supply, led by the largest supermarket chains [57]. Consistent with the literature, supermarkets in this study highlighted their strategies to grow own brand ranges, describing the scale of new product development, strict standards which were often assured by third parties, and the ability to innovate with healthy and sustainable products. Own brand foods offer large global supermarkets the opportunity to positively impact the availability, accessibility, affordability, nutritional quality, product quality, and sustainability of the food supply.

6.2.5.6 Gaps in supermarket CSR actions to support public health

Findings show that supermarkets made few CSR commitments to the public health nutrition attributes of accessibility, availability (other than supermarket own brand food development), food cost and affordability, food preferences, and nutritional quality. Whilst supermarkets appeared willing to take steps to improve sustainable sourcing of specific ingredients, there was little action being taken to support health and nutrition. The following section identifies gaps and opportunities.

Accessibility

Supermarket CSR initiatives to address accessibility of healthy and sustainable food mainly focused on education. Other CSR initiatives such as ensuring underserved communities had access to supermarkets, and committing to locate nutritious foods in more prominent in-store locations than nutrient-poor foods were less common. The amount of shelf space and the location of foods in stores influence food choice [66]. CSR commitments to remove nutrient-poor confectionery, snacks, and sweetened beverages from checkouts and other prominent areas would assist in protecting public health.

Availability

Few CSR commitments were made regarding the public health priority of increasing availability of heathy, sustainably sourced, local, or fresh foods. Instead, supermarket

own brand product ranges that meet specific needs such as additive free, vegetarian, organic, and free from common allergens were highlighted. Supermarkets are an important source of healthy foods, however availability is less than ideal: less than half of packaged foods available in Australia and New Zealand could be classified as healthy [16]; household availability of nutrient-poor ultra-processed foods in European countries ranged from 10 percent in Portugal to 50 percent in the UK [485]. Ultra-processed foods are increasingly sold in supermarkets around the world [78]. Therefore, ensuring a variety of nutritious fresh or minimally processed foods are widely available in the world's largest supermarkets is essential for public health.

Food cost and affordability

Commitments to ensuring food is affordable were made by a number of supermarkets, however, only two referred to measures that combined cost with health. UK based Tesco Plc stated they would ensure healthy foods cost no more than the less healthy version, which refers to some foods where the nutritional quality can vary considerably between products, for example salt-reduced canned vegetables compared with standard canned vegetables, or fat-reduced cheese compared with full-fat cheese. Australia based Woolworths referred to developing an affordable healthy eating index. Whilst both initiatives show promise, transparency in determining the foods to monitor, criteria used to define 'healthy', impact on shopper behaviour, and actions to address unintended consequences are needed. Making data from these initiatives publicly available to enable independent scrutiny would be of benefit to public health.

Food preferences and choices

Supermarkets committed to a variety of food labelling initiatives to assist consumers to identify foods that are: healthy or sustainable, meet specific needs, are locally sourced, or that address animal welfare concerns. Some supermarkets highlighted healthier foods using shelving signage or on their websites. The Guiding Stars scheme, implemented by Ahold Delhaize in the US and Loblaws in Canada, aims to overcome the plethora of packaging information by highlighting healthy choices using a shelf-edge tag and includes branded and own brand foods [302]. Guiding Stars has been effective in encouraging consumers to purchase more healthy foods [486]. A drawback of the Guiding Stars scheme is the lack of transparency in the algorithm applied to determine healthy foods, as it is a proprietary scheme [404]. This is important because

nutrition ratings systems and symbols currently used around the world vary in their purpose and methods, achieving inconsistent dietary outcomes [409]. The benefit of supermarket-led whole-of-store schemes is that they remove the reliance on multiple manufacturers for implementation of voluntary front-of-pack labelling, facilitating widespread adoption and consumer use. Going forward, integrated assessment of environmental and nutritional factors is needed to promote healthy and sustainable food selection [487].

Nutritional quality

Nutrient targets for reformulation of processed own brand foods were referred to by some supermarkets. Whilst nutrient reduction policies of food manufacturers and retailers have been encouraged by many working in public health [166], others challenge this strategy, referring to it as 'damage limitation' [145], expressing concern that it may encourage consumption of ultra-processed foods [76]. Provision of own brand food ranges designated as healthy may assist consumers, however transparency of criteria used by supermarkets is needed to enable assessment.

Four supermarkets have shown leadership by setting targets for the nutritional quality of own brand food sold and two have extended this commitment to all food. These initiatives have great potential to hold supermarkets to account for their impact on population diets. Again, transparency of criteria to determine what constitutes healthy products is needed.

6.2.5.7 Strengths and limitations

There are strengths and limitations to this study. A major strength is the systematic method adopted to select the world's largest supermarkets, which means the CSR initiatives described have enormous scale and reach in the global population. This is the first study to summarise CSR commitments by global supermarkets that impact public health, which is important because of their governance role within the food system (whereby they influence policy and set rules). The number of countries affected by the selected supermarkets' CSR actions demonstrates the global nature of their impact on public health. Limitations include the possibility that some important information was overlooked, as the research materials were restricted to reports that referred to CSR or sustainability for practical reasons. Supermarkets' corporate

websites may include additional information on their CSR actions, or provide some of the detail that was lacking in CSR reports, such as criteria applied to determine healthy products. Supermarkets were not contacted to provide further information or clarification as the purpose of the review was to examine publicly available information. Quality of the statements made in supermarket reports was not evaluated as that was not the purpose of this descriptive analysis. It is recommended that further research is undertaken to explore these potential gaps and that quality should be considered in any future analysis of specific CSR commitments. The scope of this study did not include the 'corporate political activity' of global supermarkets (i.e. activity undertaken with the aim of influencing political outcomes that can impact public health, including lobbying and legal action [60]) which is an important gap in knowledge.

6.2.6 Conclusions

The political CSR lens applied in this study identified the inherent responsibilities of powerful supermarkets to society, including food governance, the food system, and all aspects of a safe, nutritious and environmentally sustainable food system. CSR commitments made by 31 of the world's largest supermarkets showed how they claim to support and encourage healthy and sustainable diets. Supermarkets' efforts to demonstrate good corporate citizenship focused on: donating surplus food to charities to feed the hungry, reducing and recovering food waste, sustainably sourcing ingredients, governance of food safety, and growing their own brand foods. Although a number of supermarket CSR initiatives identified showed some progress is being made to address food waste, assure food safety and quality, and support selection of healthy foods, the world's largest supermarkets could do more to use their power to support public health, including:

- Transparently report food waste encompassing the whole of the food system in waste reduction efforts;
- Support healthy and sustainable diets by reducing production and consumption of discretionary foods, meat, and other ingredients with high social and environmental impacts;

- Remove confectionery, sweetened beverages and nutrient poor snacks from prominent areas in stores;
- Ensure a variety of nutritious fresh and minimally processed foods are available; and
- Introduce initiatives that aim to make healthy foods more affordable, support consumers to select healthy and sustainable foods, and measure and report the proportion of healthy food sales as a proportion of total food sales, using transparent criteria for key terms.

6.3 Publication #8: The nature and quality of Australian supermarkets' policies which can impact public health nutrition and evidence of practical application: a cross-sectional study [1]

6.3.1 Abstract

Improving population diets is a public health priority, and calls have been made for corporations such as supermarkets to contribute. This is particularly important in countries with limited government public health nutrition policy action. Supermarkets hold a powerful position as primary gatekeepers to the food system, and one source of power is supermarket own brand foods (SOBF). Many of the world's largest supermarkets have voluntary corporate social responsibility (CSR) policies which can impact public health, but little is known about their quality or practical application. The Australian supermarket sector is highly concentrated, with two major chains accounting for 70% of grocery sales, and SOBF accounting for 25%. This study examined the nature and quality of Australian supermarkets' CSR policies which can impact public health nutrition and the evidence of practical application for SOBF. A content analysis of publicly available CSR policies was conducted. Evidence of supermarkets putting CSR policies into practice was derived from audits of availability, price, placement and promotion of 3940 SOBF in three large exemplar supermarkets (Coles, Woolworths, IGA) in Perth, Western Australia. All supermarkets had CSR policies that could impact public health nutrition; over half related to environmental sustainability, and few addressed accessibility, availability, or affordability of nutritious SOBF. In store, all supermarkets sold nutritious SOBF and used marketing techniques which made them highly visible. Half of the CSR policies lacked specificity, providing vague or ambiguous statements that could not be assessed. These findings suggest Australian supermarket CSR policies are not likely to adequately contribute to improving population diets or sustainability of food systems. Setting robust and meaningful targets, and improving transparency and

[1] This is the submitted version of the following article: Pulker CE, Trapp GSA, Scott JA, Pollard CM. The nature and quality of Australian supermarkets' policies that can impact public health nutrition, and evidence of their practical application: A cross-sectional study. *Nutrients*. 2019; 11: 853 which has been published in final form at https://doi.org/10.3390/nu11040853.

specificity of CSR policies would improve the nature and quality of supermarket CSR policies and increase the likelihood of public health benefit.

6.3.2 Introduction

Poor diet is one of the most important risk factors for early deaths globally [2], and improving population diets is a public health priority [5, 6]. The impact of corporations' actions on public health has been described as the 'corporate determinants of health', recognizing their influence can be positive or negative [155]. Transnational food producers have been identified as drivers of global obesity due to their supply of cheap, tasty and convenient foods that are persuasively marketed [488], with the primary objective of generating profit [489]. In addition, some food corporations have used their power to set policy agendas and influence government decisions that negatively impact public health [490], referred to as corporate political activity [60]. Globally, development of supermarkets has impacted population diets by encouraging increased consumption of nutrient-poor processed foods [12]. In contrast, corporations that create jobs, pay their share of taxes, value and empower employees including paying a living wage, and contribute to society can have a positive influence [155]. Therefore, holding corporations to account for actions that can impact public health is important [338].

6.3.2.1 The impact of supermarkets on population diets

Some of the ways that corporations can impact dietary intake are mapped in an ecological framework, which includes physical environments (e.g. supermarkets) and macro-level environments (e.g. food production and distribution systems) [7]. Physical environments or settings (e.g. supermarkets), also known as food environments, can support or undermine healthy eating [9]. The within-store food environment attributes of product, price, placement, promotion, and provision of nutritional information can influence consumers' food choice [10]. Supermarkets decide which products are available, how they are arranged on shelves, their price, and promotions, which sets boundaries on the choices available to consumers [125]. A number of practices that could negatively impact dietary intake have been identified in Australian supermarkets: less than half of supermarket packaged foods are classified as healthy [16]; snack foods including crisps, chocolate and confectionery are prominently displayed at supermarket ends-of-aisles and checkouts [14, 15]; and foods designed to appeal to children are widely available and displayed in prominent supermarket locations [17].

Supermarkets are part of a highly complex global food system (i.e. the people and activities required to make food available [61]), often involving long supply chains [491]. The globalized food system significantly impacts population diets [8], influences environmental sustainability [140] and social justice [141], and has been described as invisible to consumers [263]. This is because globalization distances consumers from their food, with a lack of transparency over social, environmental and ethical decisions [141]. After being long overlooked, the environmental sustainability of food systems is now a priority issue for public health nutrition researchers [492].

The dominant neoliberal political context minimizes government regulation to promote global trade [40], so the ability of the global food system to support healthy and sustainable population diets is influenced by supermarkets which wield enormous power and influence [12], as well as transnational food producers [151]. In Australia, two supermarket chains dominate food retailing, accounting for 70 percent of grocery sales [22]. Supermarkets act as primary gatekeepers to the Australian food system having gained power from many sources that overlap and reinforce each other [322]. Sources of power include instrumental (i.e. ability to directly influence the decisions of other actors), structural (i.e. ability to set limits on the choices available to other actors), and discursive (i.e. use communication practices to influence norms and values) [322]. Supermarket concentration has taken place in other developed countries including Austria, Canada, Denmark, Germany, France, Spain and the UK [23], which could indicate similar levels of supermarket power [322].

6.3.2.2 The impact of supermarket own brand foods on population diets

Development of supermarket own brand foods (SOBF) is a source of structural supermarket power [322]. Also known as private label, in-house brand, store brand, retailer brand, or home brand [27], they are widely available in Australian and around the world [29]. Spain, the UK and Switzerland have the highest proportion of grocery sales from SOBF (up to 45 percent) [126]. SOBF provide a number of benefits to supermarkets, including increased control over the food system for greater returns [282], access to competitor information [270], increased leverage in negotiations with suppliers [11], higher profit margins [277], and flexible sourcing with less dependence on local suppliers [24]. Australian SOBF have impacted public health in many ways [322], including

improving food safety standards [281], providing more affordable options [278], and increasing accessibility to affordable foods in the neighborhoods with supermarkets [282]. However, supermarkets determine what food is sold, which influences what food is produced [12]. They have been instrumental in increasing availability of standardized cheap processed food [24], and encouraging consumption of nutrient-poor foods [282]. They have shaped norms and values around food that meets consumer needs [252], driving development of convenient SOBF such as ready meals [247].

Few studies have described the contribution of SOBF to population diets, comparing them to branded foods for sodium [30], other nutrients [31], serve size [31], and cost [36]. There were no consistent differences in nutritional quality across all foods, but some differences at the level of food category [30, 31], and some cost savings [36, 37]. Studies of the nutritional quality of SOBF conducted in the Netherlands [32], the UK [33], Spain [34], and Ireland [35], found similarly inconsistent results. SOBF in the Netherlands [32] and France [138] were significantly cheaper than the branded equivalent. There are no studies of the impact of SOBF on any aspect of sustainability to the authors' knowledge.

6.3.2.3 Policy role of supermarkets in addressing poor diets and promoting sustainable food systems

Food policy action to encourage and support healthy dietary behaviour has been mapped in a framework, by Hawkes *et al.* (2013), which recognizes the influence of food environments and the food system, as well as individual level behaviour, over population diets [8]. Policy levers can be 'soft' (e.g. voluntary initiatives) or 'hard' (e.g. price incentives, taxes, or regulations), and food corporations can contribute to improving population diets [493].

The United Nations (UN) and World Health Organization (WHO) have identified contributions profit-making corporations can make to addressing poor diets and promote sustainable food systems. The 1987 UN Commission on Environment and Development proposed a global agenda for change to address the environmental impact of ongoing development, which called on corporations to accept more responsibility [454]. The 2004 WHO global strategy on diet, physical activity and health included a significant role for corporations, promoting healthy diets and making affordable, healthy foods widely available for consumers [494]. The UN Decade of Action on Nutrition resolution recommended corporations support governments to

implement policies to address the burden of diet-related noncommunicable diseases, whilst managing conflicts of interest [6].

6.3.2.4 Supermarket voluntary policies which can impact population diets

Many of the world's largest supermarkets have voluntary policies which impact population diets, referred to as corporate social responsibility (CSR) [495]. CSR includes voluntary policies of individual corporations, voluntary participation in public-private-partnership initiatives (e.g. Healthy Food Partnership in Australia [442]), or voluntary participation in industry-led initiatives (e.g. Australian Food and Grocery Council's responsible children's marketing initiative [374]).

There are numerous CSR definitions, including political theories which state that large, powerful companies need to act as good corporate citizens, taking responsibility for impacting society to protect their position and power [58]. Other CSR theories include: instrumental (i.e. corporations implement CSR as a means to generate profits), ethical (i.e. corporations implement CSR due to ethical concerns), and integrative (i.e. corporations implement CSR because continued support of society is essential for ongoing growth) [58].

Criticisms of CSR include being used as a means for food companies to prevent regulation [46], placing responsibility for selecting healthy foods onto consumers [45], for supermarkets to push problems such as food waste onto other parts of the food system [123], and that CSR documents have lacked detail such as specific measures, and independent assessment [496].

6.3.2.5 Ability of supermarket CSR policies to address poor diets and promote sustainable food systems

Little is known about supermarket CSR policies which can impact population diets or sustainability. Previous research has shown that supermarkets were less active than food manufacturing and food service companies in having CSR policies to assist customers to select nutritious foods in Australia [55]. UK supermarkets used CSR as a tool for competition [463], and could do more to support their customers to eat healthily [50]; and US supermarkets tended to focus CSR efforts on social initiatives such as sponsoring local charities [464]. UK supermarkets' CSR policies to encourage

sustainable diets were assessed as weak, due to the focus on continuing financial growth [497]; and Swedish supermarkets were willing to support customers to make more sustainable food choices provided they did not impact profits [498]. None of these studies assessed supermarket CSR policies relating to all aspects of public health nutrition (i.e. provision of safe, nutritious, affordable, secure, and environmentally sustainable food [65]) which includes the attributes of accessibility, availability, cost and affordability, food preferences and choices, food safety and quality, nutritional quality, and environmental sustainability [322], which is an important gap in knowledge.

In addition to identifying supermarket CSR policies which can impact public health nutrition, it is important to analyse their quality, and evidence of practical application. This is because supermarkets may not adhere to CSR policies, which can be influenced by their quality [499]. The Access to Nutrition Index (ATNI) monitors the contribution of the world's largest food manufacturers to global nutrition issues by assessing the nutritional quality of their products and CSR policies [163]. An assessment of Australian supermarket CSR policies that can impact obesity prevention, based on the ATNI methodology, rated the comprehensiveness, specificity, and transparency of CSR policies [166]. It concluded that Australian supermarkets needed to place more importance on nutrition within their corporate strategies, to improve the healthfulness of supermarket environments [56].

Analyzing supermarket CSR policies could stimulate change throughout the food system [466]. Therefore, investigating the nature and quality of Australian supermarket CSR policies which can impact public health nutrition, and identifying evidence of practical application, could lead to positive change. This study aimed to identify Australian supermarkets' public health nutrition-related CSR policies, assess their quality, and identify evidence of supermarkets putting them into practice for SOBF.

6.3.3 Methods

6.3.3.1 Study scope

The study aimed to address two research questions: (1) What is the nature and quality of Australian supermarket CSR policies which can impact public health nutrition? (2) Is there evidence of Australian supermarkets putting public health nutrition-related CSR policies into practice within their stores? For the purpose of this study, public

health nutrition is defined as provision of safe, nutritious, affordable, secure, and environmentally sustainable food [69], and includes the following attributes: accessibility, availability, cost and affordability, food preferences and choices, food safety and quality, nutritional quality, and environmental sustainability [29]. CSR is defined as voluntary policies which are specific to the supermarket, as well as voluntary participation in public-private-partnership initiatives or industry-led initiatives.

Evidence of putting public health nutrition-related CSR policies into practice was collected via audits of supermarket SOBF in store. SOBF were selected because they play a pivotal role as both a source of supermarket power and impacting on public health [29], and supermarkets control SOBF so have more capacity to make the changes required to support dietary change, compared to branded foods.

Data collected from publicly available supermarket CSR policies were used to guide the analysis. Data collected from supermarket audits of SOBF provided evidence of the CSR policies in practice.

6.3.3.2 Data collection of CSR policies

Websites for the main supermarkets present in Australia were searched for information referring to CSR or sustainability. Coles Supermarkets Australia Pty Ltd (Coles) and Woolworths Supermarkets (Woolworths) together account for 70 percent of grocery sales in Australia [22]. Independent Grocers of Australia supermarkets (IGA) contribute a low overall share of grocery sales nationally, but represent the largest number of stores (over 50 percent) in WA [37], so they were also included. Discount retailer Aldi was excluded from this study due to the limited range of foods sold [325], and because it had only just entered the WA market at the time of the study [500]. The website of Australia's largest wholesaler Metcash, which supplies most products to the IGA network of independent stores and is responsible for marketing IGA [286], was also searched for information referring to CSR or sustainability. CSR policies available on the websites were included as research materials.

6.3.3.3 Data collection of CSR evidence

Selection of supermarkets to audit

In store audits of all SOBF were conducted in three purposively selected supermarkets, one for each chain. The stores were selected because they were 'optimised' (i.e. large supermarkets with an increased likelihood of displaying most of the available SOBF, and the most up-to-date layouts and displays [403]), and conveniently located in Perth, WA. The Woolworths 'next generation' store had been recently extensively refurbished [326]. The IGA was the WA 'IGA store of the year'. The Coles store was located close to parent company Wesfarmers' offices, meaning it would receive ongoing scrutiny from senior executives. The supermarket audit methods are provided in detail elsewhere and described briefly below [403].

Identification of SOBF

SOBF were identified by presence of supermarket branding on the front-of-pack and referring to the supermarket websites [436, 437]. All packaged foods and non-alcoholic beverages (referred to as food hereon in) carrying a supermarket own brand (SOB) were audited, including pre-packed fresh products such as fruit, vegetables and meat that carried the supermarket's name on the label. A list of SOB is provided in Table App 7.8.

Data collection from supermarkets

Two researchers visited each supermarket together to conduct the audit during a 3-week period in February 2017. This timing avoided product changes that occur during Christmas and the Australian school summer holiday period, and prior to Easter. All aspects of supermarket food environments were audited including products available, price, placement, promotion and provision of nutrition information [10]. Photographic images were taken of the front-of-pack, shelf-edge label, location of the product, and promotions for all SOBF present during the audit period and filed electronically. Back-of-pack information, which typically includes the ingredients list and nutrition information panel, was not collected in store as the intent was to reflect a typical consumer shopping experience where purchase decisions are made within a few seconds [232], indicating little time is spent consulting the back-of-pack information.

Data were extracted from the photographs into a database that was constructed in Microsoft Excel (Version 2013, Redmond, Washington, USA). Pre-coded responses were established for each column of data for consistency of data entry. Product groups were assigned based on the supermarket layouts, where similar products were displayed together. Within each product group (e.g. bakery and desserts) food groups were also assigned (e.g. bread).

Data entry for the first product group was piloted to ensure all relevant information from the photographs was captured, and establish the suitability of the pre-coded responses. Both researchers who collected the data completed data entry, which was then reviewed for accuracy and changes made by the first author as required to ensure consistency.

6.3.3.4 Assessment of CSR policies

Deductive thematic content analysis of the CSR research materials was conducted by applying a framework of supermarket impacts on public health [495], focusing on policies that related to the public health nutrition attributes of: accessibility, availability, cost and affordability, food preferences and choices, food safety and quality, nutritional quality, and sustainability [322].

A political CSR lens guided the analysis of supermarket public health nutrition-related CSR policies. Political CSR theories refer to the power held by large companies which demands they act responsibly [59] as good corporate citizens [58] in order to protect their power and position. Any reference to public health nutrition attributes in the CSR policies was recorded, and summarized in a matrix constructed in Microsoft Excel (Version 2013, Redmond, Washington, USA). The quality of CSR policies were classified as 'clear and specific', or 'vague or not specific' to show the variability in the types of policy statements made.

6.3.3.5 Assessment of store audit data

Nutritional quality

Nutritional quality of SOBF was assessed using front-of-pack information only (i.e. product name, product description, and the Health Star Rating nutrition label (HSR)). Foods were categorised as: (i) nutritious (i.e. from the recommended five food groups)

or, (ii) nutrient-poor (i.e. 'discretionary', which should only be eaten sometimes and in small amounts) based on the Australian Guide to Healthy Eating (AGTHE) [3]. The Educator Guide [227] and the Australian Bureau of Statistics' principles for identifying discretionary foods [228] guided the assessment.

Food preferences and choices

Presence of any statement, claim, or logo that related to any aspect of nutrition, health, or sustainability that can influence food selection were recorded. Classification of nutrition and health statements and claims was guided by a taxonomy which identified nutrition information, nutrition claims, health claims, and marketing statements and claims [108], including the government-led HSR which aims to assist consumers to select healthier foods [53]. Sustainability statements and claims were grouped as animal welfare, food and packaging waste, or sustainable sourcing (e.g. Fairtrade coffee).

Other supermarket audit data

Other front-of-pack statements and claims recorded related to whether SOBF were made without specific ingredients such as allergens, or suitable for specific dietary preferences such as vegetarian.

Data extracted into the database also included the shelf location of each SOBF, techniques used to make the SOBF prominent (e.g. placing the SOBF adjacent to the branded equivalent), presence of price promotions, and presence of messages indicating value for money.

6.3.4 Results

6.3.4.1 Australian supermarket CSR policies

Fifty-one CSR policies which can impact public health nutrition were made by Australian supermarkets, summarized in Table 6.4. There were more CSR policies made by Coles (51%) and Woolworths (41%) than IGA (8%) (Table 6.5). Over half (61%) of supermarket CSR policies related to an aspect of sustainability, i.e. animal welfare including sustainable fishing, food and packaging waste, and product and ingredient sourcing. Few of the CSR policies related to accessibility (2%) or affordability (4%), and none to availability; and the policies that were present did not

relate to SOBF. Some CSR policies described the importance of ensuring SOBF were nutritious (18%) or safe (8%).

Half of the supermarket CSR policies were clear and specific (Table 6.5). The vague or not specific CSR policies referred to nutrient reduction, the amount of food waste sent to landfill, food safety standards, and affordability initiatives, but did not provide targets or details of current practice. Fifty-eight percent of CSR policies were clear and specific for sustainability.

Table 6.4 Summary of Australian supermarket CSR commitments to public health nutrition[#]

Public health nutrition		Supermarket CSR policies					
Attribute		Coles		Woolworths		Metcash	
		Policies	Quality	Policies	Quality	Policies	Quality
Accessibility	*Location of stores, location of products, education and promotion initiatives to support selection of healthy foods*	None	N/A	Free fruit is available for any child shopping with an adult.	Clear and specific	None	N/A
Availability	*Availability of foods to meet specific needs, including healthy and sustainable*	None	N/A	None	N/A	None	N/A
Food cost and affordability	*Makes healthy foods affordable*	None	N/A	The Affordable Healthy Index will be developed to help customers choose healthier and affordable baskets of foods.	Vague or not specific	None	N/A
				Marketing campaigns where prices of healthier products are reduced, and tips and swaps for healthier eating are provided in stores, were run in 2018.	Vague or not specific		

Public health nutrition		Supermarket CSR policies					
Attribute		**Coles**		**Woolworths**		**Metcash**	
		Policies	**Quality**	**Policies**	**Quality**	**Policies**	**Quality**
Food preferences and choices	*Assists consumers to select the foods that meet specific needs, and encourages selection of healthy or sustainable choices, via provision of information such as labels and signs*	The Health Star Rating is applied to the front-of-pack of SOBF (1633 products).	Clear and specific	The Health Star Rating is applied to the front-of-pack of all eligible SOBF (2200 products).	Clear and specific	None	N/A
		A sourcing policy which prioritizes Australian-grown food is in place. 80 percent of SOBF is sourced in Australia.	Clear and specific				
		SOBF suitable for customers with special dietary requirements are provided, e.g. gluten free, vegetarian.	Vague or not specific				
Food safety and quality	*Traceability, hygienic stores, and avoidance of specific ingredients that are perceived to be harmful*	Coles works with suppliers to ensure SOBF are safe and high quality, e.g. by setting the Coles Manufacturing Supplier Standards.	Vague or not specific	SOBF do not contain artificial colours or flavours, or MSG.	Clear and specific	SOB 'Community Co' foods excludes artificial flavours and colours, and genetically modified ingredients.	Clear and specific

Public health nutrition Attribute		Supermarket CSR policies: Coles Policies	Coles Quality	Woolworths Policies	Woolworths Quality	Metcash Policies	Metcash Quality
Food safety and quality (continued)		SOBF do not contain 28 artificial colours, and other additives are not used when possible.	Clear and specific				
Nutritional quality	*Foods, nutrients, and portion sizes that support healthy eating*	Targets to reduce sodium, sugar and saturated fat have been set for SOBF. Prioritised product ranges include 'nutritional snacks and cereals' and sausages.	Vague or not specific	Targets to reduce sodium, sugar and saturated fat have been set for SOBF.	Vague or not specific	None	N/A
		Coles has an Internal Working Group, including nutritionists, which focused on delivering healthier choices across SOBF.	Vague or not specific	New SOBF will improve the nutritional quality of the product portfolio.	Vague or not specific		
				Woolworths has a cross-functional health working group, including nutritionists and supported by the Executive Committee, to embed a health strategy.	Vague or not specific		

Public health nutrition Attribute		Supermarket CSR policies					
		Coles		Woolworths		Metcash	
		Policies	Quality	Policies	Quality	Policies	Quality
Sustainability: animal welfare	*Sustainable fishing practices, sells cage-free eggs, bans products due to animal welfare concerns*	SOB animal welfare standards are based on the five freedoms of animals.	Vague or not specific	Own brand eggs are cage free.	Clear and specific	Phasing out SOB cage eggs by the end of 2018.	Clear and specific
		SOB eggs are cage free with animal welfare certification, e.g. RSPCA.	Clear and specific	Adopted an animal welfare standard for SOB Farmers Own milk.	Vague or not specific		
		SOB fish and seafood is certified by the Marine Stewardship Council, Aquaculture Stewardship Council, or meets Coles Responsibly Sourced Seafood criteria.	Vague or not specific	SOB fish and seafood is certified by the Marine Stewardship Council, Aquaculture Stewardship Council, Best Aquaculture Practice, and Global GAP.	Clear and specific		

Public health nutrition Attribute		Supermarket CSR policies: Coles Policies	Coles Quality	Woolworths Policies	Woolworths Quality	Metcash Policies	Metcash Quality
Sustainability: animal welfare (continued)		SOB beef has no added hormones, and antibiotics are only allowed for animal health purposes under veterinary supervision.	Clear and specific	SOB seafood products are labelled with certification eco-labels.	Clear and specific		
		SOB chicken meat is from suppliers with animal welfare certification, e.g. RSPCA.	Clear and specific	All SOB fresh chicken is from suppliers with RSPCA certification.	Clear and specific		
		SOB pork is sow stall free.	Clear and specific				
Sustainability: food and packaging waste	*Reduce food waste, sources packaging materials from sustainable sources*	Reusable plastic crates have been introduced for fruit, vegetables, poultry, red meat, and salads to reduce product damage and reduce food waste.	Vague or not specific	Targets set to reduce the amount of food sent to landfill by reducing stock loss, improving store waste management, and working with farmers.	Vague or not specific	Aim to reduce waste sent to landfill.	Vague or not specific

Public health nutrition	Supermarket CSR policies					
Attribute	Coles		Woolworths		Metcash	
	Policies	Quality	Policies	Quality	Policies	Quality
Sustainability: food and packaging waste (continued)	Target set to work with suppliers to halve food waste.	Vague or not specific	The SOB 'Odd Bunch' was created to sell misshapen fresh fruit and vegetables at affordable prices.	Vague or not specific		
	Launched 3 fresh produce SOBF which use vegetables which would otherwise contribute to landfill.	Vague or not specific	The packaging format for SOB potato and pasta salads was changed to reduce the amount of plastic used.	Vague or not specific		
	Launched a SOB banana bread, which uses bananas which would have otherwise gone to landfill.	Vague or not specific				
	SOB fresh beef, pork and lamb mince are packaged in an ultra-high barrier renewable and recyclable material.	Vague or not specific				
	SOB packaging will be recyclable by 2020.	Clear and specific				

Public health nutrition Attribute		Supermarket CSR policies					
		Coles		Woolworths		Metcash	
		Policies	Quality	Policies	Quality	Policies	Quality
Sustainability: product and ingredient sourcing	*Including coffee, soy, organic*	Only Certified Sustainable Palm Oil is used in SOBF.	Clear and specific	Only Certified Sustainable Palm Oil is used in SOBF.	Clear and specific	Only Certified Sustainable Palm Oil is used in SOBF.	Clear and specific
		Palm oil is specifically identified on ingredients list rather than the generic term 'blended vegetable oils' in SOBF.	Clear and specific	SOB sugar will be certified by Bonsucro.	Vague or not specific		
		SOB coffee is certified by UTZ, Fairtrade or Rainforest Alliance.	Clear and specific	A SOB range of sustainably certified tea will be launched in 2018, with all own brand tea certified by 2020.	Clear and specific		
		SOB tea is certified by UTZ, Fairtrade or Rainforest Alliance.	Clear and specific				
		SOB cocoa and chocolate will be from certified sources by 2020.	Clear and specific				

Sources of supermarket CSR commitments [334, 335, 501-508]; SOBF is supermarket own brand food, SOB is supermarket own brand.

Table 6.5 Number of Australian supermarket CSR policies to promote public health nutrition[#]

Public health nutrition attribute	Supermarket CSR commitments					
	Coles		Woolworths		Metcash	
	Policies	Clear and specific	Policies	Clear and specific	Policies	Clear and specific
Accessibility	0	-	1	1	0	-
Availability	0	-	0	-	0	-
Food cost and affordability	0	-	2	0	0	-
Food preferences and choices	3	2	1	1	0	-
Food safety and quality	2	1	1	1	1	1
Nutritional quality	4	0	5	0	0	-
Sustainability: animal welfare	6	4	5	4	1	1
Sustainability: food and packaging waste	6	1	3	0	1	0
Sustainability: product and ingredient sourcing	5	5	3	2	1	1
Total	26	13	21	9	4	3

Sources of supermarket CSR policies [334, 335, 501-508].

6.3.4.2 Practical application of CSR policies

Accessibility, availability, and affordability

Audit data showed the extent to which the supermarkets made nutritious SOBF available, accessible, and affordable. Availability of nutritious SOBF varied between supermarkets, with Woolworths making the largest proportion available (54%) (Table 6.6). Eleven percent of nutritious SOBF were made accessible by the supermarkets locating them on the most prominent shelf. In Coles, 71% of available nutritious SOBF were highlighted with a pricing message on the shelf-edge (i.e. signaling every day value, not a special discounted price), also present for 26% of IGA and 5% of Woolworths SOBF. Seventy-five percent of nutritious SOBF across all supermarkets were prominently placed adjacent to the branded equivalent, or co-located with a range of SOBF in a block. Six percent of SOBF were price promoted (i.e. displayed a special discounted price).

Food preferences and choices

CSR policies made by Coles and Woolworths to apply the HSR to all SOBF were not achieved in practice. HSR was only present on 66% of Coles and 51% of Woolworths SOBF (Table 6.6). Nutrition and health-related statements and claims which imply foods are nutritious choices were present on 66% of SOBF. Health marketing techniques, including emphasis on naturalness and promotion of balance or goodness, were common on SOBF in Woolworths (73%) and Coles (69%), but not IGA (18%). Nutrition claims were also used on a larger proportion of Woolworths (25%) and Coles (20%) SOBF compared to IGA (12%). Health claims, which included health endorsements, were present on few (2%) SOBF in any supermarket. Eleven percent of SOBF suitable for special dietary requirements were available in Coles, consistent with their CSR policy which did not provide any specific targets.

Table 6.6 Evidence of Australian supermarkets putting public health nutrition-related CSR policies into practice

	Coles		Woolworths		IGA	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Nutritious SOBF as assessed using the principles of the AGTHE*						
Available nutritious SOBF	830	47.9%	969	53.5%	141	35.5%
Located on most prominent shelf	211	12.2%	190	10.5%	23	5.8%
Other prominence techniques used	737	42.6%	582	32.1%	136	34.3%
Price promotions present	36	2.1%	79	4.4%	6	1.5%
Everyday low pricing message present	589	34.0%	45	2.5%	37	9.3%
Other pricing message present	38	2.2%	93	5.1%	24	6.0%
Food preferences labelling statements and claims						
No artificial colours/ flavours/ preservatives/ MSG	1063	61.4%	1082	59.7%	29	7.3%
Allergen advice	144	8.3%	98	5.4%	32	8.1%
Certified organic/ organic	48	2.8%	126	7.0%	0	0.0%
Vegetarian/ vegan product	89	5.1%	25	1.4%	0	0.0%
GI claims	48	2.8%	0	0.0%	0	0.0%
Front-of-pack nutrition labels						
Health Star Rating present	1141	65.9%	923	50.94%	0	0.00%
Daily Intake Guide present	215	12.4%	465	25.66%	313	78.84%
Nutrition and health statements and claims						
Nutrition claims present	348	20.1%	450	24.83%	49	12.34%
Health claims present	14	0.8%	52	2.87%	11	2.77%
Health marketing techniques present	1198	69.2%	1316	72.63%	71	17.88%

	Coles		Woolworths		IGA	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Sustainability statements and claims						
Sustainable fishing statements and claims	65	3.8%	68	3.8%	27	6.8%
Animal welfare statements and claims	185	7.1%	81	4.5%	1	0.3%
Sustainable sourcing statements and claims	54	3.1%	37	2.0%	4	1.0%
Total audited products	**1731**		**1812**		**397**	

[*]AGTHE is the Australian Guide to Health Eating [3]; [#]Poti et al. classifications of convenience [73]; SOBF is supermarket own brand food, WA is Western Australia

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Food safety and quality

No specific statements about compliance with food safety standards were made on the front-of-pack of any SOBF. All supermarkets made CSR commitments related to the avoidance of artificial colours, flavours, MSG, or genetically modified ingredients (Table 6.4). Labelling claims about the absence of these artificial ingredients were prevalent on many SOBF from Coles and Woolworths (Table 6.5).

Nutritional quality

Coles and Woolworths set targets for nutrient reduction which could not be assessed because the targets were not specified (Table 6.4). The CSR commitment by Woolworths for new SOBF to improve the nutritional quality of the product portfolio was also not specific enough to enable verification.

Sustainability: animal welfare

Cage free eggs were committed to by Coles and Woolworths, however audits found not all were free range (Coles: 3 of 4; Woolworths 1 of 3; IGA 0 of 3) (Table 4). Coles and Woolworths had CSR policies relating to sourcing fish and seafood certified as sustainable (Table 6.4). Almost all SOBF fish products (i.e. frozen fish, canned fish, and packaged fresh fish) made statements or claims about sustainable fishing, with some products making more than one claim (Table 6.7). Coles had CSR policies to protect animal welfare for beef, chicken, and pork; statements and claims were present on 48% of all Coles SOB meat products (e.g. bacon, burgers, canned meat, and packaged fresh meat). Woolworths made CSR policies to protect animal welfare for chicken, and chicken carried the most animal welfare statements and claims present (59%).

Sustainability: food and packaging waste

CSR policies to reduce the amount of food waste sent to landfill were made by all supermarkets, although none were specific (Table 6.4). There were eight misshapen fresh fruit and vegetables packaged with The Odd Bunch SOB present in Woolworths. Most policies were not suitable for assessment using the audit findings, and no other efforts to reduce food or packaging waste were observed in the audits.

Table 6.7 Sustainability statements and claims present on Australian supermarket own brand foods: animal welfare

	Coles		Woolworths		IGA	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Cage-free eggs						
Free range eggs	3	75.00%	1	33.33%	0	0.00%
Total audited eggs	*4*		*3*		*3*	
Made with free range eggs	7	0.40%	7	0.40%	0	0.00%
Sustainable fishing						
Responsibly caught/ sourced/ farmed fish	54	84.38%	13	20.31%	1	5.00%
Dolphin friendly/ Dolphin safe: drift net free	0	0.00%	31	48.44%	13	65.00%
Certified sustainable seafood MSC/ Alaska Seafood logo	11	17.19%	11	17.19%	3	15.00%
Pole and line caught	0	0.00%	12	18.75%	1	5.00%
FAD free tuna	0	0.00%	0	0.00%	9	45.00%
Wild caught	0	0.00%	1	1.56%	0	0.00%
Total audited fish and seafood	*64*		*64*		*20*	
Five freedoms of animals						
RSPCA approved	55	28.21%	34	17.35%	0	0.00%
Sow stall free pork	43	22.05%	0	0.00%	1	3.45%
Free range meat	9	4.62%	16	8.16%	0	0.00%
From hens free to naturally roam and perch	4	2.05%	0	0.00%	0	0.00%
Pasture fed/ grass fed	0	0.00%	1	0.51%	0	0.00%
Outdoor bred	0	0.00%	1	0.51%	0	0.00%
Use of hormones or antibiotics						
Antibiotic free	0	0.00%	1	0.51%	0	0.00%
No added hormones beef	64	32.82%	20	10.20%	0	0.00%
Total audited meat products	*195*		*196*		*29*	

Sustainability: product and ingredient sourcing

All supermarketshad CSR policies to source certified sustainable palm oil, but there were no statements or claims made on the front-of-pack of SOBF. It is likely that statements would be made in the ingredients list on the back-of-pack. Other CSR policies from Coles and Woolworths described efforts to source ethically certified coffee, tea, cocoa and chocolate, or sugar (Table 6.4). Only 4 ethical sourcing statements or claims were present on IGA SOBF (1%). Ethical sourcing statements and claims were present on 59% of specified SOBF in Coles, and 56% of specified SOBF in Woolworths (Table 6.8). They were most prevalent on sugar. Ethical sourcing certification logos present included Fairtrade, the Fairtrade cocoa program, Rainforest Alliance, Rainforest Alliance cocoa, UTZ, and Bonsucro.

Table 6.8 Sustainability statements and claims present on Australian supermarket own brand foods: ethical sourcing

	Coles			Woolworths		
	Frequency	**Percent**	**Total audited products**	**Frequency**	**Percent**	**Total audited products**
Chocolate	11	57.9%	19	3	37.5%	8
Cooking chocolate	4	44.4%	9	0	0.0%	8
Hot chocolate	1	50.0%	2	0	0.0%	0
Sugar and syrups	7	77.8%	9	9	81.8%	11
Coffee	5	50.0%	10	18	69.2%	26
Tea	3	75.0%	4	0	0.0%	1
Total	**31**	**58.5%**	**53**	**30**	**55.6%**	**54**

6.3.5 Discussion and policy implications

This unique study analysed the presence and quality of Australian supermarkets' CSR policies related to nine attributes of public health nutrition, and identified evidence of supermarkets putting them into practice. This is important because CSR practice has a more direct influence on food environments than CSR policies [164].

6.3.5.1 Implications of CSR policies

Coles and Woolworths had more CSR policies which can impact public health nutrition compared to Metcash, suggesting a stronger commitment. This finding is

consistent with the political CSR lens applied, whereby the most powerful Australian supermarkets [322] had more CSR policies, which may assist in protecting their position and power [59]. Wesfarmers (which owns Coles) and Woolworths make some important contributions to society: they are Australia's two largest companies by revenue [509], employing 418,000 people [501, 504]. However, the supermarkets are unlikely to contribute to positive dietary change without CSR policies addressing the fundamental issues of accessibility, availability, and affordability of nutritious SOBF [65].

Coles, Woolworths and Metcash are members of the government-led Healthy Food Partnership which aims to improve the health of all Australians, however the initiative is still in development after three years [510]. Coles and Woolworths have also been key supporters of the HSR nutrition label launched in 2014 [53], but their uptake of the scheme has been slow, and a number of issues including lack of transparency have been identified [511]. The lack of supermarket CSR policies which could contribute to positive population dietary change is a weakness in the current policy approach, particularly in the current context of limited Australian government policy action to improve population diets since 2010 [299].

6.3.5.2 Quality of CSR policies

Australian supermarket CSR policies varied in quality: half lacked specificity, providing vague or ambiguous statements that could not be assessed. A UK study of the quality of supermarket CSR policies to remove unhealthy food from checkouts found that supermarkets which provided specific details had good levels of adherence [499]. Voluntary initiatives including CSR maintain credibility by being transparent, and specifying benchmarks or targets to enable objective evaluation [44]. Australian supermarkets can gain credibility for their CSR efforts to impact public health nutrition by providing specific details, setting transparent targets, and regularly reporting progress made.

6.3.5.3 Evidence of putting CSR policies into practice

Despite the absence of CSR policies relating to availability of nutritious SOBF, this study revealed that all supermarkets had nutritious SOBF available, but the proportion varied considerably between supermarkets. This could be addressed with CSR policies that set targets for the proportion of SOBF that are nutritious, using transparent criteria

to assess nutritional quality. Supermarkets Ahold Delhaize [435] and Marks and Spencer [512] have such targets in place, aiming to increase the proportion of sales from nutritious SOBF.

Audit findings also indicated that supermarkets could do more to make nutritious foods accessible, by placing them on shelves at eye-level, offering price promotions, and using messages on shelf-edge labels. The shelf-edge labelling system Guiding Stars, used in some US and Canadian supermarkets, has been applied to all products to guide consumer selection of nutritious foods [301]. Australian supermarkets could apply the HSR to shelf-edge labels to guide consumer food selection across all food, not just those that are packaged. CSR policies to improve the accessibility of nutritious foods in Australian supermarkets are needed as a priority.

Australian supermarkets should also consider implementing CSR policies to ensure nutritious SOBF cost no more than nutrient-poor SOBF, following the example set by Tesco [513]. Government-led market basket surveys which monitor the cost of healthy food suggest that SOBF are cheaper that the branded equivalents [37]. The Woolworths initiative to develop an affordable healthy eating index indicates potential for public health benefit. However, the index is a subjective measure of consumer opinion [514], not an objective measure of the affordability of healthy foods at Woolworths. For public health impact, an objectively derived index is recommended, with transparency over the foods included, and criteria used to define 'healthy' and 'affordable'.

Coles CSR policies stated they set product safety and quality standards, which they require suppliers to meet. They referred to audits of suppliers, and disclosed the number of products recalled due to product safety issues [501]. Yet their CSR policies were vague and did not provide any specific details or targets. No other reference to the importance of food safety was provided by any supermarket. These findings are consistent with previous research which found that supermarkets enforce rules about acceptable food safety and product quality to manage reputational risk [264], and their standards are typically more stringent than government food safety standards [515]. Suppliers are required to provide assurance of food safety to enable them to do business with supermarkets [256], however these standards are not communicated to consumers on labels [269]. Supermarkets make important decisions regarding food safety

risk that affects public health [258], suggesting that increased transparency regarding the standards set and levels of compliance is needed.

Supermarkets influence population health by determining the contribution of added fats, sugars, and salt to SOBF [24]. Targets to reduce sodium, sugar, and saturated fat in SOBF were referred to by Coles and Woolworths, however details of the targets were not provided. The Woolworths CSR policy that new SOBF would improve the nutritional quality of the range also lacked detail about how this would be achieved. Making nutrient reduction targets publicly available is important [166] to increase transparency and credibility [44].

Nutrition and health statements and claims which imply foods are nutritious choices were widely used on Coles and Woolworths SOBF. CSR policies to ensure these statements and claims are only used on nutritious SOBF that are consistent with the AGTHE five food group foods [3] are recommended to prevent deceptive marketing practices [108].

6.3.5.4 CSR policies to support sustainability

Over half of supermarket CSR policies related to the sustainability attribute, including setting animal welfare and ethical sourcing standards. Coles and Woolworths committed to animal welfare standards for SOBF in a number of ways, for example only selling only cage-free eggs, sustainably sourced fish and seafood, and ensuring the five freedoms of animals were upheld [516]. These animal welfare standards are an important step, but do not extend far enough to have meaningful impact as they have established a consumer driven-model of animal welfare, rather than enforcing the welfare of all farmed animals [517]. Not all relevant SOBF were labelled with animal welfare certification, indicating CSR policies were not achieved. In addition, the use of labelling to highlight sustainability standards has been challenged by the assertion that all food should be sustainable [492]. This is important because Australians reportedly lack the knowledge and motivation to select foods consistent with environmental sustainability [518], even though third party certification of sustainability standards, such as ethical sourcing or animal welfare, guarantees adherence [519].

Whilst sustainable sourcing initiatives can contribute to improving some aspects of the food system, they do not address the bigger issue of encouraging healthy and

sustainable population diets [482]. The supermarket CSR policies did not refer to healthy and sustainable diets, which may be because there is not one commonly agreed upon definition [498] or approach to describing the level of sustainability of a diet [520]. One definition of healthy and sustainable diets is: reducing overconsumption, reducing the amount of nutrient-poor discretionary foods eaten, and replacing animal-based foods with plant-based foods [521]. As discretionary foods accounted for a third of Australian diet-related environmental impacts, a reduction in production and consumption would have a significant impact [483]. Australian supermarkets should introduce CSR policies to reduce production and consumption of discretionary foods, and other foods such as meat which have high environmental impacts, to encourage healthy and sustainable diets in a more meaningful way. For example, two Swedish supermarket chains have campaigns to encourage consumers to reduce meat consumption and eat more vegetarian food instead [484].

6.3.5.5 Implications of conducting supermarket audits

CSR practice has a more direct influence on food environments than CSR policies, so including product information in monitoring is recommended [164]. Whilst the inclusion of supermarket audits to evaluate how well CSR policies were applied in practice was time consuming, this study reveals several advantages including: (i) identifying specific CSR policies which fill gaps that have potential for public health nutrition impact, (ii) exposing weaknesses in practical application of supermarket CSR policies, and (iii) assessing supermarket CSR policies and practical application across all aspects of food environments that can influence consumer food selection.

Identifying specific CSR policies with the potential for impact to fill existing gaps is a priority. For example, there were no effective CSR policies to improve the availability, accessibility, or affordability of nutritious SOBF. The supermarket audit data provided information about the supermarkets' current performance, enabling recommendations for specific CSR policies with potential for public health nutrition impact.

Analyzing supermarket audit data can expose weaknesses in practical application of CSR policies. Coles and Woolworths had CSR policies to implement HSR on all SOBF, yet the supermarket audits revealed the policies have not been achieved. Similarly, audit data revealed Coles and Woolworths' animal welfare standards were

only applied to specific SOBF and were therefore more limited in reach than CSR policies implied. These findings indicate supermarkets should be held accountable to an empowered independent body for fulfilling their CSR policies [490, 522].

Finally, including supermarket audit data, rather than product information, means the impact of supermarket CSR policies on all aspects of food environments that can influence consumer food selection (i.e. the products available, their price, promotion, placement, and provision of nutrition information [10]) can be assessed, and what can be measured is more likely to be acted on.

This study's findings indicate that setting robust and meaningful targets, improving transparency and specificity of CSR policies, and regularly updating progress in CSR reports would improve the nature and quality of supermarket CSR policies for public health benefit. Measures to hold supermarkets accountable for fulfilling their CSR policies would assist in improving translation into practice. Researchers in other countries with high proportions of grocery sales from SOBF (e.g. Spain, the UK and Switzerland) may find conducting a similar analysis assists in identifying the ability of supermarket CSR policies to contribute to improving population diets and sustainability of food systems.

6.3.5.6 Strengths and limitations

This is the first study to comprehensively analyse all of the attributes of public health nutrition that can be impacted by supermarket CSR policies, including environmental sustainability. Strengths of this study include the extensiveness of the in-store data collection from audits of three purposively selected supermarkets to describe the nature and extent of SOBF. This comprehensive information provided evidence of supermarkets' translation of public health nutrition-related CSR policies into practice. Quality of CSR policies was also reported. A number of limitations relate to this study. Back-of-pack information present on SOBF was excluded, so nutrition information panels, ingredient lists, and allergen declarations were not assessed as evidence of supermarkets putting CSR policies into practice. Some CSR policies may relate to this information, and therefore results for evidence of supermarkets putting CSR policies into practice may be understated. Only publicly available supermarket CSR policies were included in this study, so other work may be in progress that can positively influence public health nutrition. CSR policies that related to internal initiatives could

not be verified in this study (e.g. working groups to deliver healthier SOBF). Although this study focused on supermarket CSR policies which can impact public health nutrition, other food system actors including government, food manufacturers, and food service operators have important contributions to make. Further research to investigate policies which can impact public health nutrition from these actors is needed.

6.3.6 Conclusions

Corporations including supermarkets have been charged with contributing to improving population diets and sustainability of food systems. This is particularly important for countries with limited government public health nutrition policy action, such as Australia. Supermarket CSR policies in Australia can impact public health nutrition, but few addressed accessibility, availability, or affordability of nutritious SOBF. All supermarkets sold nutritious SOBF and used marketing techniques which made them highly visible in store. Sustainable sourcing CSR policies were only implemented for some SOBF, and did not address the bigger issue of supporting healthy and sustainable diets. Half of the supermarket CSR policies lacked specificity, providing vague or ambiguous statements that could not be assessed. These findings suggest Australian supermarket CSR policies are not likely to adequately contribute to improving population diets or sustainability of food systems.

6.4 Summary of the chapter

This chapter described the publicly available CSR commitments that can impact public health, made by thirty-one of the world's largest and most powerful supermarkets. Five common priorities of global supermarkets' CSR commitments were identified and critiqued. Whilst global supermarkets have taken steps to sustainably source specific ingredients, few CSR commitments related to improving population diets. Recommendations for future CSR action were made. Similarly, most Australian supermarket CSR policies which can impact public health nutrition related to sustainability, and few addressed the accessibility, availability, or affordability of nutritious supermarket own brand foods. Photographic audits revealed that Australian supermarkets sold nutritious supermarket own brand foods and used marketing techniques which made them highly visible in store. Half of the CSR policies lacked specificity, providing vague or ambiguous statements that could not be assessed. These findings suggest Australian supermarket CSR policies are not likely to adequately contribute to improving population diets or sustainability of food systems.

Chapter 7 DISCUSSION AND CONCLUSION

7.1 Overview of the chapter

The aim of this research was to examine Australian supermarkets' CSR commitments that impact public health, and evidence of practical application, by analysing the contribution of supermarket own brand foods to Australian consumer nutrition environments. This chapter discusses the research findings of eight studies in relation to the thirteen research questions (Figure 3.1), and the existing literature. The strengths and limitations of the research are described, and recommendations for public health research, policy and practice, and supermarkets are identified.

7.2 Key findings

Finding 1: Australian supermarkets hold a powerful position as gatekeepers to the Australian food system, having obtained instrumental, structural, and discursive power from many sources. Their position as unappointed guardians of public health has led to provision of cheap, safe food, but few positive impacts were identified overall.

The scoping review of supermarket power (study two) addressed the research question: *What is known about the multifaceted position Australian supermarkets occupy in the food system, including power and influence over other actors?* A key outcome was the development of a detailed conceptual framework to assess the dimensions of supermarket power and influence, which was used to identify the sources of supermarket power.

The conceptual framework (Figure 2.3) expanded on the work of Clapp and Fuchs [47] and Mialon *et al.* [60] because this previous work had focused on food governance (i.e. how rules or decisions within the food system are made) [47] and corporate political activity (i.e. the ways food companies exert political influence over government policies that impact public health) [60], and a broader public health lens was required for the analysis. Application of the detailed conceptual framework developed for this study identified that supermarkets have obtained instrumental, structural, and

discursive power from many sources that overlap and reinforce each other. The main sources of supermarket power were high market concentration, the ability to set the terms of trade for suppliers, governance of the food system via private quality standards, development of supermarket own brands, and framing issues around the identities of food system actors and societal norms. A finding of particular concern for public health was that political legitimacy of supermarket power was achieved through their authority status, which has not been challenged by the government or consumers.

An important finding from the review was that supermarkets ultimately make the decisions about the offer available in stores, including promotions, with the strategies and techniques employed by large supermarket chains to maximise sales becoming very sophisticated. The documents reviewed stated that large multinational manufacturers can gain competitive advantage over smaller suppliers, but this is related to meeting the costs and challenges of doing business with supermarkets; they are not in a position to assert power over the supermarkets but can indeed influence their decisions. A paper by Sutton-Brady *et al.* (2017) included in study two describes the dependency of even the largest suppliers on doing business with the two supermarket chains [242].

The scoping review (study two) also addressed the research question: *What are the implications of supermarket power for public health?* Evidence of the ways supermarket power impacts public health was derived from analysis of the literature, and mapped in the domains of food governance, the food system, and public health nutrition (Figure 2.6). Analysis of the literature revealed that supermarkets acted as unappointed guardians of public health [282]. Although an enormous benefit of supermarket power has been provision of cheap, safe food [249], few positive impacts on public health were identified in the analysis. The key negative impacts of supermarket power identified were that supermarkets influence national food and nutrition policy and population diets through their participation in Australian government public-private-partnerships [294, 295], act as gatekeepers of food standards [24, 251] and the food supply [266, 296], have entrenched an industrial food system that is invisible to consumers [43, 263], sell products of poor nutritional quality [253, 287], and encourage consumption of nutrient-poor foods [12, 124, 282].

Study two is the first of its kind to examine the implications of supermarket power for public health. To date, the power of transnational food manufacturers [164], and their behaviours and strategies that undermine public health [60, 145, 147] have received attention in the literature, and supermarkets have been overlooked. This current study found that very little public health research has examined the implications of supermarket power in Australia, which is surprising given the high level of supermarket concentration [22], and the projected increase in sales of supermarket own brand foods [124].

Evidence of how supermarkets impact public health identified in study two informed the thematic content analysis of supermarket CSR data in studies seven and eight. For study seven, a framework of supermarket impacts on public health (Figure 6.1) based on evidence of how supermarket power impacts public health was constructed. For study eight, the framework for analysis focused on the public health nutrition domain.

Finding 2: This research highlighted the pivotal role of supermarket own brand foods as a source of supermarket power and their potential impact on public health, and described their contribution to the healthfulness of consumer nutrition environments using the comprehensive assessment tool developed to address gaps in knowledge.

The significant role of supermarket own brand foods as both a source of supermarket power and impacting on public health was another key finding from study two. They are pivotal because developing own brand foods allows Australian supermarkets to exert more control over the food system, as they expand into manufacturing [282]. The study identified that supermarket own brand foods strengthen supermarkets' knowledge about the supply base [235], and their bargaining position with suppliers of branded foods [239]. These foods have been utilised to build consumer loyalty and develop trust [282]. Supermarkets have the opportunity to positively influence population diets by improving the nutritional quality of supermarket own brand foods [24], by selecting nutritious products and ingredients, and setting targets for the nutrient content of processed foods.

The scoping review of Australian consumer nutrition environments (study one) addressed the research question: *Which domains of the consumer nutrition environment (i.e., product, price, placement, promotion) have been examined in*

Australian peer-reviewed research? A key finding was that little was known about the contribution of supermarket own brand foods to Australian consumer nutrition environments. Only two Australian studies had compared the nutritional quality of supermarket own brand foods with branded foods concluding they were not nutritionally inferior [30, 31], and one study found significant cost savings when replacing branded foods with the own brand equivalent [36]. Prior to this thesis, there had been no comprehensive assessment of the contribution of supermarket own brand foods to consumer nutrition environments.

To address the pivotal role of supermarket own brands identified in study two, and the gaps in knowledge identified in study one, a comprehensive assessment tool to describe the contribution of supermarket own brand foods to the healthfulness of consumer nutrition environments was developed (study five). Supermarket audits were conducted to answer the following research question: *What is the extent and nature of supermarket own brand foods in Australia?*

Analysis of the Australian literature that has examined consumer nutrition environments (study one) revealed a lack of consistent methodology and tools, making comparisons of study findings difficult. In response to this finding, the detailed protocol for conducting photographic audits of supermarket own brand foods was published in an open access journal (study five). The protocol addressed the important gap by using standardised criteria to define recommended nutritious foods to reduce subjectivity in interpreting analysis of product nutritional quality. A decision tree was developed for the protocol, to inform consistent categorisation of product nutritional quality according to the principles of the Australian Guide to Healthy Eating [3] (Table 3.1). This is a key outcome of the study protocol, and assisted in classifying chilled ready-to-eat convenience foods, which have not previously been addressed by the Australian government's Eat for Health Educator Guide [227] or the Australian Bureau of Statistics principles for identifying 'discretionary foods' [228].

Finding 3: Physical changes to Australian supermarket environments, which include CSR commitments to stop promoting unhealthy foods as healthy, would assist parents to navigate common within-store food marketing techniques to select healthy foods.

The impact of within-store marketing techniques on parents' ability to select healthy packaged foods was examined in focus groups (study four), which addressed the following research questions: *Who do parents believe is responsible for giving them the information they need to make healthy food choices for their children? What role do parents believe food companies (including supermarkets) should take in helping them select healthy foods for their children?* A key finding from the focus groups was that parents of young children were unable to decipher packaging information due to information overload, so had difficulty identifying healthy packaged foods.

To understand the types of within-store marketing techniques parents encounter when selecting packaged foods, audits of packaging information were conducted (study three) to address the following research question: *What voluntary nutrition and health labelling, claims, and marketing techniques are present on high market-share ultra-processed foods in Australian supermarkets?* Key outcomes include a taxonomy of nutrition and health related packaging information, and identification of the widespread presence of nutrition and health statements and claims on ultra-processed foods.

The taxonomy of nutrition and health related packaging information (Figure 4.2) developed for study three integrated information taken from a number of earlier studies [86, 313, 314]. The taxonomy omitted some food labelling information included in the INFORMAS taxonomy [313], because it is mandatorily required on food labels in Australia so not applicable to this study which focused on voluntary information. Mayhew *et al.*'s analysis framework [314] was very broad, and only marketing techniques to promote health and wellbeing were of specific relevance to this study. Mehta *et al.*'s criteria for food marketed at children [86] were included because they were detailed and specific. Practical application of the taxonomy to analyse packaging information present on ultra-processed foods, including some supermarket own brand foods (study three), found they are attractively packaged with almost all products making nutrition and health statements and claims.

The dominant neoliberal political agenda, which favours voluntary CSR by food companies, was found to restrict consumers' ability to select healthy foods in these two studies (studies three and four). Although the government-led HSR nutrition label was introduced as a mechanism to assist consumers to select healthy processed foods,

study four identified that parents did not use it. Of particular relevance to this thesis, the focus groups revealed that parents had some trust in supermarkets suggesting supermarkets could assist parents by taking a structural approach to CSR. The study findings suggest that supermarkets could provide shopping environments that support healthy choices by applying appropriate health criteria for foods sold in health food aisles, placing healthy foods in prominent locations, introducing shelf-edge labels to identify healthy choices, providing product information for online shoppers, and stopping the use of nutrition and health statements and claims on packaging of unhealthy foods.

Findings from studies three and four provided context for the rest of the thesis. The taxonomy of nutrition and health related packaging information developed for study three was later used to inform the data extracted from the photographic audits of supermarket own brand foods (study five). Findings from the focus groups with parents of young children (study four) provided context for analysis of Australian supermarket CSR (study eight).

Finding 4: Comprehensive photographic audits of Australian supermarket own brand foods identified that application of the HSR nutrition label has served to promote nutrient-poor food choices, which is counter its purpose.

Comprehensive photographic audits of supermarket own brand foods (study five) were conducted to address the following research question: *What is the extent and nature of supermarket own brand foods in Australia?* Utility of the database of supermarket own brand food marketing practices, constructed using data extracted from 3940 products, was demonstrated by examining use of the HSR nutrition label on supermarket own brand foods (study six). The research questions this study addressed were: *What is the prevalence of nutrition labels on the front-of-pack of Australian supermarket own brand foods? How do Australian supermarket own brand foods rate for nutritional quality? Are Australian supermarkets using HSR labels to promote nutritious or nutrient-poor own brand foods?*

The power and influence of supermarkets Coles and Woolworths over the Australian food system was a key finding from study two. This means that supermarket support of the HSR system is significant, particularly as they had committed to apply the label to all supermarket own brand foods by the end of June 2015 [523]. Key findings from

study six were that supermarkets have not complied with CSR policies to apply the HSR label to all applicable own brand foods, and application of the HSR on supermarket own brand foods has served to promote nutrient-poor and ultra-processed foods.

Lack of compliance with their own policies to label supermarket own brand foods with the HSR raises questions about supermarkets' ability to implement voluntary CSR policies that can positively impact public health. The lack of supermarket CSR polices which could contribute to improving population diets, a key finding in study eight, highlights the importance of practical application of any CSR policies that can positively impact public health. Public regulation and market intervention have been highlighted as the only evidence-based mechanisms that can protect public health from the impact of unhealthy food products and harmful corporate behaviour [145]. The findings from study six, which show nutrient-poor and ultra-processed supermarket own brand foods were more likely to include the HSR than nutritious foods, indicate mandatory regulation is needed. Mandating the HSR would ensure its use is widespread across all foods and avoid any misuse as a health halo [395] on nutrient-poor foods.

Caution is urged in continuing to use the HSR in its current form, as either a voluntary or mandatory mechanism. The most important finding of study six is that a large proportion of supermarket own brand foods are being promoted as nutritious choices when they are not, and many nutritious dairy foods are being promoted as less nutritious choices when they are not. The study revealed that the HSR algorithm, which allocated 39 percent of discretionary foods and 84 percent of mixed products high in fat sugar or salt a HSR of 2.5 or over, is not consistent with the stated policy aim of "*guiding consumers to the selection of foods consistent with the Australia and New Zealand dietary guidelines"* [524]. Changes to the HSR algorithm and applicable foods are urgently needed to ensure the nutrition label promotes the recommendations of the Australian Dietary Guidelines. Based on this study's findings, robust and transparent decisions about the HSR cut-off used to indicate appropriate product scores are essential, to ensure future changes to the HSR algorithm contribute to meeting the policy aim.

Finding 5: Some CSR commitments made by thirty-one of the world's largest supermarkets indicated they have the potential to positively impact public health, but few CSR commitments addressed attributes of public health nutrition apart from sustainability.

The CSR commitments that can impact public health from thirty-one of the world's largest supermarkets were examined (study seven) to address the following research question: *What public health related corporate social responsibility commitments have been made by supermarket chains globally?* The ways that supermarket power impacts public health, identified in study two, informed analysis of CSR data. A key finding from study seven was that some progress is being made by some supermarkets to address food waste, assure food safety and quality, and support selection of healthy foods. However, there were no exemplar supermarkets with strong CSR commitments across all public health attributes.

Prior to this study, global supermarket CSR activity that can impact public health had not been systematically identified or evaluated. A key finding was that the world's largest supermarkets could do more to use their power to support public health. Supermarkets made few CSR commitments related to the public health nutrition attributes of accessibility, availability, food cost and affordability, food preferences, and nutritional quality. Instead, CSR commitments referred to ethical sourcing of specific ingredients, animal welfare standards, and reducing food and packaging waste. It is likely that global initiatives such as the Global Reporting Initiative [340], FTSE4Good [456], the Dow Jones Sustainability index [457], and the UN Global Compact [458], which consider aspects of environmental sustainability but not public health, have influenced this current focus. The ATNI [163], which assesses the world's largest food manufacturers' CSR policies, is the only global initiative to encourage investors to consider corporate impact on health and nutrition as part of their risk assessment [455]; but does not include supermarkets. An Australian assessment of supermarket CSR commitments that can address obesity, based on the ATNI methodology, concluded that health and nutrition was not a priority for the sector [56].

The findings of study seven indicate that the number of public health-related CSR commitments made by Australian supermarkets is comparable with the rest of the global supermarket sector. Across all fourteen public health attributes assessed,

Woolworths (n=32) and Coles (n=28) had more CSR commitments than average (mean=23, range=4-37). The large number of gaps in Australian supermarket CSR commitments related to improving population diets were consistent with the rest of the global supermarket sector. The findings that specifically relate to Australian supermarkets are addressed in the next section.

Finding 6: Current Australian supermarket CSR commitments are not likely to adequately contribute to improving population diets or sustainability of food systems, providing opportunities for supermarkets to improve their impact on Australian consumer nutrition environments.

Study eight addressed the following research questions: *What is the nature and quality of Australian supermarket CSR policies which can impact public health nutrition? Is there evidence of Australian supermarkets putting public health nutrition-related CSR policies into practice within their stores?* The study drew on the findings from the rest of this thesis, including: study two which identified the pivotal role of supermarket own brand foods as a source of supermarket power and impacting public health; study four, which identified that Australian supermarkets appear to be trusted by parents of young children; study three which identified that almost all packaged ultra-processed foods featured marketing techniques promoting health and wellbeing despite their typically poor nutritional quality; and study five, which described compilation of a database of supermarket own brand food marketing practices, using a comprehensive supermarket audit protocol to guide data collection.

The lack of Australian supermarket CSR policies which could contribute to positive population dietary change was a key finding from study eight. This is important because global initiatives, such as the UN Decade of Action on Nutrition [6], have identified the need for food companies including supermarkets to make nutritious foods available and affordable, and support governments to implement policies to improve population diets and sustainability of the food system. It is particularly concerning that supermarkets appear to be taking little action to address Australian public health nutrition within the context of limited Australian government food and nutrition policy action since 2010 [299].

Study eight identified that half of the Australian supermarket CSR commitments lacked specificity or provided vague statements that could not be assessed, and

supermarkets had not fully implemented some of their CSR commitments (e.g. HSR nutrition labels, animal welfare standards). Two studies which examined supermarket CSR policies in other countries suggested poor quality CSR policies are less likely to be effective [165, 499]. Findings from study eight indicate that assessing the quality of supermarket CSR policies provides an important indicator of the potential for impact. However, supermarkets are more likely to be held to account for their action or inaction when evidence of translation of public health nutrition-related CSR policies into practice is demonstrated via in-store data collection.

The findings, which include the nature and quality of Australian supermarket CSR policies and evidence of practical application, have revealed areas of focus for future supermarket CSR policies. In addition, the proportion of poor quality CSR policies and weaknesses in translation indicate Australian supermarkets need to be held to account for their impact on public health nutrition, via ongoing monitoring and evaluation. To date, only one initiative has attempted to hold Australian food companies to account; the INFORMAS '*Inside our food companies*' project, which monitors food company policies that can impact public health nutrition. However, all nine public health nutrition attributes are not included because the focus of INFORMAS was limited to the prevention of obesity and obesity related non-communicable diseases [525]. Whilst an initiative to monitor Australian supermarket CSR policies that can impact all public health nutrition attributes would address the findings of study eight, this thesis has identified compelling evidence that an independent, multi-stakeholder global initiative for public health reporting, which rates all aspects of corporate impact on public health including population diets, is needed.

7.3 Strengths and limitations

Strengths of the research are derived from addressing gaps in knowledge regarding the public health impacts of Australian supermarkets. This thesis includes the first study to summarise the existing peer reviewed literature relating to consumer nutrition environments in Australia (study one), the first study to examine the sources of supermarket power and the implications for public health (study two), and the first study to summarise global supermarkets' CSR policies that impact public health (study seven).

The conceptual frameworks and other methodological tools which were adapted or developed for use in the eight studies provide another strength of this thesis. They include a conceptual framework to map the domains and sub-domains of consumer nutrition environments (study one); a framework of the dimensions of supermarket power and influence (study two); a taxonomy of nutrition and health related packaging information (study three); a procedure to classify foods consistent with the Australian Guide to Healthy Eating which added two new groups to address difficulties in classifying chilled convenience foods (study five); and a framework of supermarket impacts on public health (studies seven and eight). The conceptual frameworks could be applied in future studies to investigate corporate power, consumer nutrition environments, packaging information that can assist consumers to select healthy foods, the contribution of specific products to the healthfulness of food environments, and CSR commitments and evidence of practical application.

Weightings of relative importance were not used when identifying different attributes of CSR that relate to public health nutrition (e.g. Figure 6.1), or marketing techniques present on packaging (e.g. Figure 4.2) because there is a lack of evidence to determine the relative importance of each attribute identified. Weighting is applied to the assessment criteria for the ATNI, which evaluates the biggest global food manufacturers' voluntary policies, based on input from experts and the public [163]. However, there is no transparency over the input provided or decisions made, so the ATNI could not be used to inform this research. Observational studies which identify priorities for public health benefit are needed, which can inform weighting of the relative importance of each attribute identified in the tools.

Strengths of the supermarket audits include the purposive selection of large supermarkets, which increased the likelihood of more supermarket own brand foods being available. The stores were selected based on my prior experience of working for supermarkets, whereby implementation of policies, product displays, and ensuring good product availability are influenced by the store manager and their team. Stores which receive a high level of internal scrutiny (e.g. new, refurbished, or located close to the head office) are more likely to have high performing teams which can meet internal expectations. I consulted head office staff from each of the supermarkets prior to selecting the three stores. No-one would agree to recommending stores for the audits, but the head office staff supported the rationale for selection. The selected

stores, which were examples of best practice for each supermarket chain, were more likely to implement pricing, placement, and promotional techniques to high retail standards. The extensive data collection conducted over a short time period was more likely to represent consumer nutrition environments experienced by consumers, rather than provide an account of the food supply over an extended period of time. The large sample size and number of photographic images collected also add strength to this thesis, which utilised the supermarket audit data in studies six and eight.

The global supermarkets included in study seven, which investigated public health-related CSR policies, operated across over fifty countries, which means the CSR initiatives described have enormous scale and reach in the global population. This is a strength because of the power of global supermarkets, and their governance role within the food system. The global supermarket CSR study also provided context for a detailed analysis of Australian supermarkets' CSR policies which can impact public health nutrition (study eight). Strengths of study eight, which analysed Australian supermarket CSR policies, was the inclusion of nine public health nutrition attributes, assessment of the quality of the CSR policies, and analysing evidence of implementation in stores.

The main limitation of the included studies relates to data collection taking place in one Australian location. Supermarket audits, audits of packaging information, and focus groups all took place in Perth, Western Australia. It is not known whether availability of packaged foods, including supermarket own brand foods, differs markedly between Australian States and Territories. An assessment of the generalisability of supermarket audits conducted across Australia is therefore needed. In addition, focus group findings (study four) cannot be generalised to the broader Australian population.

Limitations of the scoping reviews (studies one and two) and the content analysis of global supermarkets' CSR policies (study seven) include the possibility that search strategies did not identify all relevant documents, and therefore some evidence has been overlooked. For all three studies, the quality of included documents was not assessed, although this was consistent with the aims and objectives of each study.

A limitation of the studies which used supermarket audit data (studies five, six, and eight) was the lack of back-of-pack photographs for supermarket own brand products,

apart from for chilled convenience foods. The nutrition information panel, ingredients lists, and other nutrition and health-related information such as allergen declarations or details of ethical sourcing initiatives, is usually located on the back-of-pack. However, some products displayed the full HSR label, or the full Daily Intake Guide label, which include nutrition information. Seasonality may also affect findings, as data collection was conducted over a three-week period and audits conducted at other times of the year may find different availability of supermarket own brand foods. In addition, supermarkets were not contacted to verify product data, or to provide supplementary information about their publicly available policies. Although this is consistent with the INFORMAS recommendation to focus on monitoring publicly available policies to assess the impact of food companies on food environments, because few resources are required and the research is relatively low-cost[164], future research should include input from supermarkets as work may be in progress that can positively influence public health nutrition that has not yet been reported.

Discount supermarket chain Aldi was excluded from supermarket audits (studies five, six and eight) because of the limited range of foods sold, and the fact Aldi had only just entered the WA market at the time of the study. However, Aldi has been credited with making a significant impact on the Australian food retail industry, including driving discount pricing strategies and development of supermarket own brand foods [22]. Low-priced supermarket own brand foods comprise 90% of foods sold at Aldi, therefore the implications of the discount retail model for public health deserves further investigation.

The focus group research (study four) was conducted in 2015 and use and perceptions of the HSR may have changed over time.

Analysis of the ways supermarkets impact public health focused on identifying the nature and quality of CSR policies and evidence of practical application. This is because the ability of the global food system to support healthy and sustainable eating behaviours is influenced by powerful supermarkets, who can implement CSR commitments to improve policies and practices. However, supermarket corporate political activity, whereby they exert power and influence over government policy that can impact public health, was not assessed. Supermarkets were not contacted to

provide further information or clarification about their CSR policies, and other work may be in progress that can positively influence public health nutrition.

7.4 Recommendations for further research

Recommendation 1: Investigate the complex relationships between supermarkets, and other powerful food system actors such as transnational food manufacturers, to compare the ways they exert power which impacts public health.

This is the first research study to examine how supermarket power impacts public health. However, the power of transnational food companies [164], their ability to exert power in order to influence Australian nutrition policy [299], influence population diets via products and marketing, and shape government policies using corporate political activity [146], has been highlighted, which raises questions about the power relations between different types of companies within the food system. The gap in information about supermarket power in relation to the rest of the Australian food system, identified in study two, suggests further examination and monitoring of the impact of supermarket power and influence in practice is needed. Research which investigates the complex relationships between supermarkets, transnational food manufacturers, and their industry associations, to identify whether supermarket power allows them to influence public health in different ways to other food system actors is recommended. This is important because study two revealed that some practices which have been identified as a source of discursive power for the Australian food industry (e.g. framing government action to protect public health as 'nanny state', or criticising public health advocates) appear not to have been used by supermarkets. Examining the internal drivers of public health nutrition decision making by Australian supermarkets, including identifying who exerts power and influence, is also warranted.

Recommendation 2: Given the power of Australian supermarkets, it is important to further explore supermarket consumer nutrition environments, focusing on comparing the contribution of supermarket own brand foods with the branded equivalents.

The power of Australian supermarkets, which was described in study two, highlights the influence of supermarkets over all aspects of the Australian food system, especially

consumer nutrition environments. The database of supermarket own brand food marketing practices, constructed using data extracted from 3940 products (study five), can be utilised to describe the ways supermarket own brand foods contribute to the healthfulness of consumer nutrition environments. However, further research which focuses on comparing the contribution of supermarket own brand foods with the branded equivalents is recommended. The research should compare the supermarket own brand and equivalent branded products available, their pricing, placement, promotions and nutritional quality. The framework developed for study one, which summarises the domains and sub-domains of consumer nutrition environments which can influence consumer food selection should be applied. The study protocol described in study five should be adapted to include data collection for equivalent branded products.

Recommendation 3: Conduct regular monitoring and surveillance of the world's largest supermarkets' CSR policies which can impact public health, applying the framework of supermarket impacts on public health.

Supermarket CSR activity that can impact public health had not been systematically identified or evaluated prior to this research. Ongoing monitoring of the world's largest supermarkets' public health-related CSR policies, using the framework of supermarket impacts on public health (Figure 6.1), is recommended to ensure annual CSR reports are evaluated for changes in impact. A case study approach which focuses on each of the largest companies, similar to the examination of European retailer Lidl conducted by von Phillipsborn *et al.* (2018) [165], is recommended to achieve breadth and depth of analysis. Specific focus on large supermarkets present in emerging economies will assist in examining the public health impact of rapid supermarket growth. Findings from study eight, which revealed half of the Australian supermarkets' CSR policies were of poor quality and there were weaknesses in translation in-store, indicate that quality assessment and evidence of practical application using store audits are needed to reveal the extent to which global supermarkets are taking action to support healthy and sustainable population diets.

Recommendation 4: Develop a global initiative for public health reporting, which rates all aspects of corporate impact on public health, including population diets.

This thesis has identified compelling evidence that an independent, multi-stakeholder global initiative for public health reporting, which rates all aspects of corporate impact on public health including population diets, is needed. Friedberg (2018) suggested that large supermarket chains, and other powerful food companies, lack sufficient knowledge and data to prioritise and implement CSR policies that can impact sustainability, which leads them to participate in multi-stakeholder initiatives [526]; perhaps knowledge gaps have contributed to the lack of action to address the other public health attributes. However, the number of global initiatives which place importance on environmental impact reporting appears to have influenced the focus of supermarket CSR policies on aspects of sustainability, and not population diets. The recommendation for further research to develop a global reporting initiative for public health is reinforced by the 2019 EAT-Lancet report [493], which identified the important role of supermarkets and other food system actors in increasing availability, accessibility, and affordability of healthy diets from sustainable food systems. The global initiative should define and prioritise the ways food companies can implement ongoing action to contribute to public health goals, using examples of good practice and acknowledging achievements. To maximise impact, involvement of investors is recommended.

7.5 Recommendations for public health policy and practice

Improve transparency of supermarket influence over government-led food and nutrition policy

- Assess and report on the nature and extent of supermarket (i.e. Coles and Woolworths), and wholesaler (i.e. Metcash) influence over decisions that affect Australian food and nutrition policy, by analysing their contribution to the HSR system and the Healthy Food Partnership.
- Examine supermarket CSR as a source of supermarket power which impacts public health, so public health practitioners can hold supermarkets to account for commitments made.

Implement policies to encourage and support healthy food environments

- Implement and evaluate public policies such as the HSR, which aims to assist consumers to select healthy packaged foods, as part of a broader range of policies designed to create healthy food environments.

- Modify the HSR algorithm to ensure it promotes the recommendations of the Australian Dietary Guidelines using three levels of detail: across food groups (i.e. nutritious and nutrient-poor food groups obtain scores that are demarcated); within food groups (i.e. best choices and all other choices obtain scores that are demarcated); and similar products from different brands obtain scores that allow for meaningful comparison.

- Implement and evaluate public policies to assist consumers to select healthy packaged foods, which address the accuracy and quality of nutritional information provided, build trust in front-of-pack nutrition labels, and reduce deceptive marketing practices.

- Increase transparency of added sugars on packaging by implementing a separate added sugars line in the nutrition information panel, and grouping added sugars together in the ingredients list.

Identify supermarket practices of public health concern to facilitate policy responses

- Develop a systematic way of using consumer nutrition environments research to identify supermarket marketing practices of public health concern, and prioritising the changes needed to increase healthy eating behaviours.

- Assess supermarket corporate political activity, which is undertaken with the aim of influencing political outcomes that can impact public health (e.g. lobbying and legal action), to identify policy action needed.

7.6 Recommendations for supermarkets

Accept the inherent responsibility supermarkets have to society as a result of their power and influence, and implement CSR policies which contribute to improving public health in a more meaningful way

- Implement comprehensive CSR policies which contribute to improving public health because the neoliberal political environment means Australian consumers rely on such voluntary measures.
- Improve the quality of CSR policies by providing specific details, setting transparent targets, and reporting progress.

Food governance

- Apply the HSR label to all supermarket own brand foods, including fresh foods, after the algorithm has been modified.
- Consider applying the HSR to shelf-edge labels of all foods and non-alcoholic beverages, so that the scheme is supermarket-wide.

Food system

- Identify vulnerable food producing communities at risk of losing livelihoods, which could benefit from supermarket policies to source own brand foods from Australian food producers.

Public health nutrition

- Implement policies that prevent deceptive marketing practices on supermarket own brand foods, e.g. remove nutrition and health statements and claims from nutrient-poor and ultra-processed foods, and remove marketing techniques designed to make nutrient-poor foods appealing to children.
- Set targets for the availability, accessibility, and affordability of nutritious supermarket own brand foods.
- Reinforce the importance of food safety and quality by making existing standards transparent to consumers.

- Measure and report the proportion of healthy food sales as a proportion of total food sales, using transparent criteria for key terms.
- Transparently report nutrient reduction targets and current status for reformulation of supermarket own brand foods and new product launches.
- Assist consumers to select healthy foods by applying nutrition criteria to foods sold in health food aisles, placing healthy foods in prominent locations, introducing shelf-edge labels to identify healthy choices, and providing product information for online shoppers.
- Remove confectionery, sweetened beverages and nutrient poor snacks from prominent areas in stores.
- Transparently report food waste, encompassing the whole of the food system in waste reduction efforts.
- Apply CSR commitments to sustainably source specific animal products and other ingredients to all supermarket own brand foods.
- Support healthy and sustainable diets by reducing production and consumption of nutrient-poor discretionary foods, meat, and other ingredients with high social and environmental impacts.

7.7 Conclusion

Findings from the eight studies in this thesis indicate that Australian supermarkets have obtained power from many sources, and act as gatekeepers to the food system. The decisions they make impact public health in the domains of food governance, the food system and public health nutrition. An enormous benefit of supermarket power has been provision of cheap, safe food. However, consumers depend on supermarkets to support public health in many other ways, by implementing CSR commitments that are transparent and open to independent scrutiny. This thesis identified a number of supermarket own brand marketing practices of public health concern. For example, application of the HSR nutrition label by two supermarkets on own brand foods has served to promote nutrient-poor and ultra-processed food choices. Ultra-processed foods were attractively packaged and included nutrition and health statements and claims, which parents struggle to navigate when selecting healthy foods. In addition, few supermarket CSR commitments related to availability, accessibility, or affordability of nutritious foods, which are fundamental requirements of a healthy and sustainable food system. Opportunities for supermarkets to improve their impact on Australian consumer nutrition environments were identified, and focus group research findings indicate supermarket action would be accepted by consumers. Recommendations were made for further public health research, public health policy and practice, and supermarkets.

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Appendix A Authorship of publications

Publication #1:

Pulker CE, Thornton LE, Trapp GSA. What is known about consumer nutrition environments in Australia? A scoping review of the literature. Obes Sci Pract. 2018; 4: 318-37.

Publication #2:

Pulker CE, Trapp GSA, Scott JA, Pollard CM. What are the position and power of supermarkets in the Australian food system, and the implications for public health? A systematic scoping review. Obes Rev. 2018; 19: 198-218.

Publication #3:

Pulker CE, Trapp GSA, Foulkes-Taylor F, Scott JA, Pollard CM. The extent and nature of supermarket own brand foods in Australia: study protocol for describing the contribution of selected products to the healthfulness of food environments. Nutr J. 2018; 17: 95.

Publication #4:

Pulker CE, Scott JA, Pollard CM. Ultra-processed family foods in Australia: nutrition claims, health claims and marketing techniques. Public Health Nutr. 2018; 21: 38-48.

Publication #5:

Pulker CE, Ching Li DC, Scott JA, Pollard CM. Who should help customers to select healthy foods in supermarkets? A qualitative study of Australian parental views. **Under review**.

Publication #6:

Pulker CE, Trapp GSA, Scott JA, Pollard CM. Alignment of supermarket own brand foods' front-of-pack nutrition labelling with measures of nutritional quality: An Australian perspective. Nutrients. 2018; 10: 1465.

Publication #7:

Pulker CE, Trapp GSA, Scott JA, Pollard CM. Global supermarkets' corporate social responsibility commitments to public health: a content analysis. Globalization and Health. 2018; 14: 121.

Publication #8:

Pulker CE, Trapp GSA, Scott JA, Pollard CM. The nature and quality of Australian supermarkets' policies which can impact public health nutrition and evidence of practical application: a cross-sectional study. **Under review.**

Publication #1

I, Claire Elizabeth Pulker, conceived the study design, research objectives and developed the research questions in consultation with GSAT, collected and analysed the data, wrote the first draft of the paper in consultation with GSAT, and made revisions using input from all authors, to the paper entitled ***What is known about consumer nutrition environments in Australia? A scoping review of the literature*** published in Obesity Science and Practice [444].

(Signature of Candidate)

I, as a Co-Author, endorse that this level of contribution by the candidate indicated above is appropriate.

Lukar E. Thornton

(Signature of Co-Author 1)

Georgina S.A. Trapp

(Signature of Co-Author 2)

Publication #2

I, Claire Elizabeth Pulker, conceived the study design, research objectives and developed the research questions in consultation with CMP, collected and analysed the data, wrote the first draft of the paper in consultation with CMP, and made revisions using input from all authors, to the paper entitled ***What are the position and power of supermarkets in the Australian food system, and the implications for public health? A systematic scoping review*** published in Obesity Reviews [322].

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I, as a Co-Author, endorse that this level of contribution by the candidate indicated above is appropriate.

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Publication #3

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Publication #4

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Publication #5

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Publication #6

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Publication #7

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Publication #8

I, Claire Elizabeth Pulker, conceived the study design and research objectives in consultation with CMP, I developed the research questions, collected and analysed the data, wrote the first draft of the paper in consultation with CMP, and made revisions using input from all authors, to the paper entitled ***The nature and quality of Australian supermarkets' policies which can impact public health nutrition and evidence of practical application: a cross-sectional study*** which is under review.

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I, as a Co-Author, endorse that this level of contribution by the candidate indicated above is appropriate.

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Appendix B Supplementary material for Publication #1: What is known about consumer nutrition environments in Australia? A scoping review of the literature

Table App 7.1 Themes identified in Australian consumer nutrition environment studies, with main findings

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Product *(n=40)*		
Product availability and quality (n=18)	*Impact of level of remoteness on availability of healthy foods* • Availability of selected healthy foods declined with increasing store remoteness in Queensland [90, 91]. • Basic food items were less available in more remote Queensland stores [92]. • There were more folate-fortified products available in city stores than in rural towns and remote areas [202]. *Impact of area socioeconomic status on availability of healthy foods* • In Adelaide, there was no significant difference in availability of healthy foods in high and low household income areas [94]. • In Brisbane, there was also little or no difference in availability of fruits and vegetables by area socioeconomic characteristics [225]. • Availability of selected healthy foods in Brisbane did not contribute to socioeconomic inequalities [95, 196]. *Impact of food outlet type on availability of healthy foods* • In rural Victoria, availability of selected healthy foods was generally greater in chain supermarkets compared to independent supermarkets [89]. • Availability of selected healthy foods was generally greater in supermarkets compared to convenience stores in rural New South Wales [201]. • Queensland supermarkets had better availability of fruit and vegetables than farmers' markets [95].	*Availability of unhealthy foods* • Take-away food outlets in rural New South Wales had few healthy food items [201]. • Availability of unhealthy foods (soft drinks, crisps, and high fat pastries) was widespread across all food outlets in rural New South Wales [201] and metropolitan Perth [208].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Product availability and quality (continued)	• In Adelaide, selected healthy foods were available at most outlets [96]. *Impact of availability of healthy foods on food choice* • Availability of selected healthy foods was not associated with purchasing choices in Brisbane [196]. *Impact of perceived availability of healthy foods* • Perceived food availability was associated with healthy food purchases in Brisbane [196], and appeared to mediate the association between socioeconomic position and diet [200]. *Interventions or policies to increase availability of healthy foods* • A health promotion intervention in a remote Northern Territory community led to an increased range of healthy foods in the community store, and the community increased purchases of healthier foods [216]. • Implementation of a nutrition policy in remote community stores in the Northern Territory was associated with dietary improvements, and availability of healthy foods [205]. *Quality of fresh produce* • Stores in low socioeconomic areas of Queensland had the poorest quality fruits and vegetables [95]. • Quality of fresh produce in Western Australia was lower with increasing store remoteness [211]. • Fruit and vegetables in stores in low socioeconomic suburbs were poorer quality [193].	

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Product assortment (n= 6)	*Variety of healthy foods available* • Most fruit and vegetables were equally available across areas of different levels of socioeconomic disadvantage in Melbourne [184] and Queensland [95]. • Brisbane supermarkets had more product variety than other types of food outlets [225]. • There were more varieties of fruit and vegetables available in highly accessible regions of New South Wales compared to remote regions (2006 and 2009 surveys) [192]. • There were fewer varieties of fruit and vegetables in stores in low socioeconomic suburbs of Sydney [193].	*Variety of unhealthy foods available* • There was a large number of snack foods (1070) and drinks (863) in a Melbourne supermarket [87]. • A third of supermarket snacks were cakes, pies, sweet biscuits, and rich breads; 25% of snacks were available in multiple flavour varieties [87].
Design of products and packaging (n=5)	*Changes in pack size of healthy foods* • Between 2005 and 2008 the pack size of yogurts and dairy desserts increased [88].	*Recommended serve sizes of unhealthy foods* • Recommended serve sizes varied greatly for snacks [87], and most unhealthy food categories [197], but was consistent for drinks regardless of pack size. [87] • Over two-thirds of single serve size packs of confectionary recommended a serving size smaller than the package size [197]. *Provision of nutrition information for unhealthy foods in fast food outlets* • In 2010 some nutrition information was available in 66% of fast food outlets, but only 5% provided nutrition information for children's meals; some nutrition information was poor quality [218]. • In 2012, most fast food outlets (95%) provided some nutrition information but only 3% provided nutrition information for all menu items [220]. • The total amount of information available increased over time, however fewer outlets provided nutrient values. [220]

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Design of products and packaging (continued)		Most (76%) nutrition information was accessible in 2010 [218], and almost all was accessible in 2012 [220].
Nutritional quality (n=18)	*Nutritional quality of healthy foods in remote communities* • Individual store managers were a greater determinant of apparent nutrient intake than the community itself [205]. *Prevalence of healthy child-orientated products* • Almost all (99%) child-orientated dairy snacks and 65% of child-orientated ice creams promotions were healthier choices [17]. • Most (69%) child-orientated products with sportspersons, celebrities, or movie tie-ins were classified as healthy [85]. *Classification of packaged foods as healthy* • Only 9–22% of snack foods and 14–27% of drinks could be classified as healthy in 2006 [87]. • Less than half (47%) of Australian packaged foods were classified as healthy using the nutrient profiling scoring criterion [16]. • Less than one-third of supermarket dairy, meat, and meat products were classified as healthy using Australian nutrient profiling criteria [16]. • Healthy gluten free packaged products had overall similar nutritional profiles to standard products, apart from for protein [226].	*Prevalence of foods with poor nutritional quality in remote communities* • Unhealthy foods contributed disproportionately to energy availability (MJ/kg) [187]. • Similar nutrient profiles were observed across stores including high sales of refined carbohydrates and added sugars, and relatively low sales of wholegrain cereals and fruit and vegetables [188]. *Prevalence of unhealthy child-orientated products* • Child-orientated promotional characters were predominantly used on unhealthy food packaging [85]. Less than half (48%) of child-orientated products with licenced, and 21% of products with company-owned characters were classified as healthy [85]. • Most (82%) food packaging promotions directed at children were for unhealthy foods [17]. Most of the products marketed to children via product packaging (75%) were unhealthy [86]. • Two-thirds of child-orientated supermarket products had been reformulated between 2009 and 2011, however there was little overall improvement [212]. • There was some variation in the energy and sodium levels of children's menu items from major multinational fast-food outlets, by country and across companies [198].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Nutritional quality (continued)	*Nutritional quality of products perceived as healthy* • Between 2005 and 2008 median energy and total fat content of yogurts increased, and protein decreased [88]. Many yogurts and dairy desserts promoted as reduced fat contained more energy than full fat products due to the high level of added sugars [88]. • A third (31%) of products carrying health claims in 2011 failed to meet nutrient profiling criteria for healthy foods [199]. 29% of products with nutrition claims in 2011 failed to meet nutrient profiling criteria for healthy foods [199]. *Nutritional quality of child-orientated products* • More than half of child-orientated foods promoted as healthy on front-of-pack labels are discretionary choices [209].	*Classification of packaged foods as unhealthy* • For a large proportion of unhealthy supermarket foods, energy per serve was higher than the dietary guidelines recommendation of 600kJ [197]. • Most (75%) convenience foods were classified as healthy using Australian nutrient profiling criteria [16]. • Unhealthy gluten free packaged products had slightly better average nutritional profiles compared with the standard products; overall these products were nutritionally poor with typically high levels of sugar, saturated fat and salt [226]. *Nutrient reduction in processed foods* • Food manufacturers made moderate progress towards meeting Food and Health Dialogue sodium targets for bread, breakfast cereal and processed meats between 2010 and 2013 [214]. • There was little evidence of a systematic effort by all manufacturers of pasta sauce to reduce sodium content between 2008 and 2011 [215]. • There were small but statistically significant reductions in the overall mean sodium concentration of a wide range of products spanning fifteen food categories [30].
Provision of supermarket own brand products (n=3)	*Nutritional quality of healthy supermarket own brand foods* • Assessment of the serve size, energy, total fat, saturated fat, and sodium content of supermarket own brands and branded products found that differences were food category specific [31]. • Supermarket own brand products cannot be described as nutritionally inferior to branded products [31].	*Nutritional quality of supermarket own brand processed foods* • Mean sodium content was lower for supermarket own brand desserts, biscuits, and processed meats [30].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Provision of supermarket own brand products (continued)	• Mean sodium content of supermarket own brand products was 17% lower than for branded products from the same categories [30]. • Mean sodium content was lower for supermarket own brand bread, and higher for breakfast cereals [30]. • There was a marked difference in mean sodium content of own brand products from different supermarket chains [30]. *Cost comparison of healthy supermarket own brand foods with the branded equivalent* • The following cost savings were made on selected recommended foods when choosing supermarket own brand products instead of the cheapest branded equivalent: bread and cereals 46%; vegetables 41%; fruit 27%; and fish and eggs 11% [209].	*Cost comparison of unhealthy supermarket own brand foods with the branded equivalent* A cost saving of 47% was made when choosing selected supermarket own brand discretionary products instead of the cheapest branded equivalent [209].
Price *(n=26)*		
Pricing strategy (n=22)	*Impact of level of remoteness on price of healthy foods* • Healthy food prices were 20% higher in remote and 31% higher in very remote areas of Queensland, compared to metropolitan areas [92]. • Healthy foods cost more in very remote areas of Queensland, with the highest prices found in stores in the most remote areas [91]. • In Victoria, healthy foods cost more the further the store was from Melbourne [210]. • Foods prices were 60% higher in community stores compared to Darwin supermarkets, and this difference increased when own brands were used in place of branded products [194].	*Comparison of the price of healthy and unhealthy foods in remote communities* • Foods with higher energy density ($/MJ) were cheaper in a remote northern Australia [187]. *Comparison of the price of unhealthy foods/diets with healthy foods/diet* • All household structures that were modelled would spend more purchasing the current unhealthy diet than required to purchase the recommended healthy diet [206]. • Energy-dense fast foods were cheaper per kilojoule than lower-energy density items. Salads had the highest energy cost, while value items, meals that included a dessert, and family meals had the lowest [219].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Pricing strategy (continued)	• The price difference between community stores and Darwin supermarkets was greater for packaged foods than fresh fruit and vegetables [194]. • Food costs were significantly higher in very remote areas of Western Australia compared to the major city, particularly for fruit, vegetables and dairy [211]. • Most foods cost more with increasing geographic isolation in Western Australia and New South Wales [192, 211]. • Healthy foods cost more in rural South Australia compared to metropolitan areas, and were even higher in more remote areas [97]. • Folate-fortified products cost more in rural towns and remote areas [202]. • Food costs in rural Victoria were not related to remoteness, or distance from the metropolitan centre [93]. *Impact of area socioeconomic status on food prices* • Food prices were lower in disadvantaged areas of Melbourne [184] and Sydney [193]. • Food prices were higher in the higher socioeconomic status areas in Brisbane [206] and Adelaide [96]. • Food prices did not significantly differ across levels of socioeconomic disadvantage in Brisbane [225], Queensland [95] Illawarra in New South Wales [224], Adelaide [94], Victoria [93, 210], or New South Wales [192]. • Differences in food prices in Brisbane did not contribute to socioeconomic inequalities [196]. • Prices of folate-fortified products in capital cities did not differ by area socioeconomic status [202].	*Change in price of unhealthy foods* • Compared to healthy foods, the price of sugar, oil, and margarine varied the least over time in Victoria [210].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Pricing strategy (continued)	*Impact of food outlet type on food prices* • Food prices tended to be cheaper in supermarket chains compared to independent stores in rural Victoria [89, 93]. • Food prices were at least 30% cheaper at discount supermarkets compared to supermarkets and independent grocers in Sydney [193]. • Fruits, vegetables and meat was slightly cheaper at independent stores in Illawarra, NSW, compared to supermarkets. [223, 224] • Darwin online supermarket prices were 5–10% higher than in-store prices [194]. • Food prices were not consistently different by type of retail outlet in Adelaide [96]. *Change in price of healthy foods* • Healthy food prices in stores across Queensland increased above the rate of inflation [90]. • The cost of healthy foods increased more than for unhealthy foods [90, 91]. • The cost of healthy foods in Illawarra, NSW, increased between 2000 and 2003, and the largest increases were for vegetables [223]. They had increased by 20% between 2000 and 2007, and the largest increases were for fruits and vegetables [224]. • The cost of healthy foods in New South Wales increased between December 2006 and 2008 and was lowest in July 2009 [192]. • The cost of healthy foods increased by 50% over six years in Queensland [91]. Cost increases were above inflation, particularly in remote areas of Queensland [90].	

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Pricing strategy (continued)	• The cost of fruit and vegetables in Victoria was more variable than other foods [210]. *Impact of price on food choice* • Differences in food prices was not associated with food choices in Brisbane [196]. *Impact of perceived food price on food choice* • Perceived differences in the price of regular and healthy foods was associated with healthy food purchases [196].	
Sensitivity and elasticity (n=4)	*Impact of price reductions on purchases of healthy foods* • Reducing the price of fruit and vegetables by 20% in Melbourne supermarkets increased household purchasing by 35% for fruit and 15% for vegetables. The behaviour-change intervention had no effect, and did not enhance the effects of price-reduction [185]. However, effects were not maintained after the discount period [203]. • In remote community stores in the Northern Territory four different price discount strategies of 10% achieved no effect on purchases [195]. Reducing the price of fruit and vegetables by 20% led to an increase in purchases by 20% for fruit, and 9% for vegetables [189].	-
Price promotions	-	-

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Placement *(n=6)*		
In-store location (n=4)	*Prevalence of healthy food displays at checkouts* • None of the supermarkets surveyed displayed fruit at checkouts, and only one store displayed vegetables [83].	*Prevalence of unhealthy food displays at checkouts, island bins, and ends-of-aisles* • Most supermarket checkouts displayed chocolate (87%), chewing gum (81%) and sweets (80%) [83]. • Snack foods (crisps, chocolate, confectionery, soft drinks) were present at checkouts, island bins, and at a third of end-of-aisle displays in supermarkets [82]. • Snack foods (crisps, chocolate, confectionery, soft drinks) were displayed at 99% of supermarket checkouts [14]. • There was no evidence of socioeconomic patterning of snack food displays in supermarkets [82]. • Rural supermarkets had a higher percentage of front-of-aisle displays than back-of-aisle displays containing soft drinks, crisps, chocolate or confectionery (49% v.26%) [190]. • Supermarkets in rural Victoria had the most checkouts displaying soft drinks or confectionery (55·4% and 28·6%); chocolate was more prominent at checkouts in metropolitan and urban-fringe areas (65·0% and 58·7%) [190].
Shelf location (n=6)	*Impact of area socioeconomic status on shelf location of healthy foods* • Supermarket shelf space allocated to fruits and vegetables did not differ by level of socio-economic disadvantage [15]. *Shelf space allocated to healthy foods* • Supermarkets in Melbourne had more shelf space allocated for fruit and vegetables compared with supermarkets in the rest of Victoria [190].	*Shelf location of unhealthy foods* • Snack food displays (crisps, chocolate, confectionery, soft drinks) were most prominent at supermarket checkouts [82]. • Chocolate was the most prominent snack foods on display in supermarkets [82]. • Only 7% of supermarket checkouts put their display of foods or drinks out of the reach of children [83]. • Supermarket island bin displays equated to a median of 19.4m additional snack foods (crisps, chocolate, confectionery, soft drinks) display space [82].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Shelf location (continued)		• The mean total aisle length of snack foods (crisps, chocolate, confectionery, soft drinks) was 45.8m in Australian supermarkets [14]. • There was no association between the proportion of shelf space allocated to unhealthy foods (AGTHE discretionary foods) and the amount purchased [217]. *Impact of area socioeconomic status on shelf location of unhealthy foods* • Supermarket shelf space allocated to snack foods (crisps, chocolate, confectionery, soft drinks) was greater in socio-economically disadvantaged neighbourhoods, even after accounting for store size [15]. • There was no difference in the amount of shelf space allocated to unhealthy foods (AGTHE discretionary foods) by area socio-economic status (SES); however shoppers from low SES areas purchased significantly more unhealthy foods than shoppers from high SES areas, especially crisps, carbonated soft drinks, and cordials [217]. *Shelf space allocated to healthy foods* • No significant differences in the shelf space allocated for crisps, chocolate and confectionery were observed throughout Victorian supermarkets, however rural stores allocated less space for soft drinks [190].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Promotion *(n=16)*		
Health messages (n=7)	*Prevalence of health messages on packaging of healthy foods* • The folate-neural tube defect health claim was not widely used; most products using the claim were breakfast cereals (60%) [202]. • A large proportion of packaged products had at least one type of health or nutrition claim. Of the products with health claims, 69% met proposed Australian nutrient profiling criteria so would be eligible to make these claims [199]. *Implementation of health messages in remote community stores* • The promotional and educational components of the Arnhem Land Progress Association nutrition policy were not widely implemented in community stores. Dietary improvements were evident in those communities where stores most complied with the policy [205]. *Consistency of front-of-pack health messages with dietary guidelines* • Within the categories of fruit snacks, soups, fruit and vegetable juices, and nectars, 48% of products made at least one claim about fruit or vegetable content but had poor nutritional quality compared to whole fruit and vegetables [221]. • Evaluation of the dairy products present in Sydney supermarkets found the nutrient profiling scoring criterion and Health Star Ratings systems appeared be consistent with the Australian Dietary Guidelines recommendations whereby lower-fat products rated higher than full fat products [222].	*Prevalence of health messages on packaging of unhealthy foods* • Two-thirds of Australian snack foods (energy-dense-nutrient-poor foods) feature the food industry's voluntary Daily Intake Guide (DIG) front of pack label. However, most products did not display high saturated fat or sugar content by using the energy alone DIG option, violating the industry's own guidelines [191]. • Only supermarket own brand snack foods (energy-dense-nutrient-poor foods) displayed saturated fat and sugar content on the DIG front of pack label [191]. • A third (31%) of packaged products making health claims did not meet proposed Australian nutrient profiling criteria so would be ineligible to make these claims [199]. • Statements and claims about health and nutrition were found on the packaging of 64% of child-orientated products [86].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Promotions targeting children (n=4)	*Changes parents shopping with children would like implemented in supermarkets* • Parents would like to see the following changes made in supermarkets: confectionery-free checkouts, minimising child orientated product placement, and reducing children's general exposure to food marketing [84].	*Marketing techniques used to promote unhealthy foods to children* • Characters from TV, films, and cartoons were used in 75% of promotions targeting children on food packaging [17]. • Sixteen techniques were used to promote packaged foods to children, including graphics, cartoons, and celebrities, with an average of six techniques per product [86]. • Promotional characters were used on packaging of predominantly less healthy products to attract children's attention [85]. • Few of the companies using characters on packaging to attract children's attention were signatories to the food industry's voluntary Responsible Marketing to Children initiative [85]. *Prevalence of promotion of unhealthy foods to children* • Between 9-35% of packaged foods from the categories of sweet biscuits, snack bars, confectionery, chips and savoury snacks, cereals, dairy snacks and ice cream used promotional tactics directed at children (i.e. premium offers, giveaways and competitions, celebrity endorsements, and cartoon and movie character promotions) [17].
Other promotions (n=6)	*Use of promotional signage to identify nutritious foods* • A health promotion intervention in a remote Northern Territory community found implementation of promotional stickers to identify recommended foods was problematic due to lack of acceptance of the sticker designs and difficulties identifying the correct foods [216].	*Prevalence of unhealthy foods in store external displays* • None of the supermarkets surveyed promoted snack foods (chocolate, chewing and bubble gum, other sweets, soft drinks, chips and savoury snacks, cakes and pastries) outside of the stores [83].

Domain and sub-domain	Main findings relating to healthy foods	Main findings relating to less healthy/ unhealthy foods
Other promotions (continued)	• Promotional materials (pull-up banners, shelf talkers, shelf stripping, and fridge stickers) to communicate a 20% price discount on fruit and vegetables in remote community stores led to an increase in purchases of 7.6% compared to the price discount alone [189]. *Impact of supermarket health promotion interventions* • A supermarket-based nutrition education programme in a Western Australian town achieved a high level of community awareness, and changes in self-reported food purchasing [213]. • A health promotion intervention in Victorian supermarkets that included food demonstrations to promote healthy eating achieved low levels of awareness with shoppers [207]. • A behaviour change intervention targeting socioeconomically disadvantaged supermarket shoppers in Melbourne was appealing to the women and led to an increase in vegetable consumption [186]. *Level of store support for supermarket health promotion interventions* • Store managers were generally supportive of a supermarket-based nutrition education programme in a Western Australian town. They reported increased sales of products during food demonstrations, and increased sales of 2% milk [213]. • Supermarket owners showed support for in-store demonstrations to promote healthy eating, saying it provided opportunities for customer communication [207].	

Table App 7.2 Recommendations for monitoring consumer nutrition environments, adapted from INFORMAS [9] and Glanz and colleagues [10, 11]

Domain	Sub-domain	Description	INFORMAS module
Product	Product availability and quality	Available healthy and unhealthy foods, product quality	Monitoring availability of healthy and unhealthy foods [66]
	Product assortment	How many products are stocked, how much variety is available	-
	Design of products and packaging	For example, products designed to appeal to children, provision of product nutrition information	Monitoring health-related labelling of foods in retail settings [313]
	Nutritional quality	Assessment of product quality using criteria to define healthy or nutritious foods, comparisons between products	Monitoring levels of important nutrients [527]
	Provision of supermarket own brand products	Products which are owned by retailers or wholesalers and sold privately in their own stores	-
Price	Pricing strategy	Price of healthy and unhealthy foods	Monitoring price and affordability of healthy and less healthy foods [528]
	Sensitivity and elasticity	The impact of price changes on consumer purchasing decisions	-
	Price promotions	Includes price reductions, multi-buy offers, and coupons	-
Placement	In-store location	Physical location within the retail outlet, e.g. checkouts, ends-of-aisles	Monitoring availability of healthy and unhealthy foods [66]
	Shelf location	Position and prominence within the fixture, e.g. at eye level, the number product facings	Monitoring availability of healthy and unhealthy foods [66]
Promotions	Health messages	Nutrition and health messages provided on packaging, promotional material, or signage	Monitoring health-related labelling of foods in retail settings [313]
	Promotions targeting children	Use of fun designs, cartoons, or characters on food packaging to appeal to children	Monitoring food promotions to children [529]
	Other promotions	Use of signage, banners, shelf labelling, samples, and taste testing	-

Table App 7.3 Summary of findings for Australian supermarket consumer nutrition environments

Domain	Sub-domain	Findings
Product	Product availability and quality	• Chains had better availability of healthy foods compared to independent supermarkets [89] and convenience stores [201]. • Better availability of fruit and vegetables than farmers' markets [95].
	Product assortment	• More product variety than other types of food outlets [225]. • Sell a large number of snack foods and soft drinks including cakes, pies, sweet biscuits, and rich breads; many were available in multiple flavour varieties [87].
	Design of products and packaging	• Pack size of yogurts and dairy desserts increased between 2005 and 2008 [88]. • Many unhealthy packaged foods had a larger serve size than recommended by dietary guidelines. Over two-thirds of single serve confectionary recommended a serving size smaller than the package [197]. • Recommended serve sizes varied greatly for snacks [87], and most unhealthy foods [197], but was consistent for drinks regardless of pack size [87].
	Nutritional quality	• Less than half of packaged foods were classified as healthy, including less than one-third of dairy, meat, and meat products [16]. • Nutritional quality of yogurts declined between 2005 and 2008. Many reduced fat yogurts and dairy desserts contained more energy than full fat products due to added sugars [88]. • Healthy gluten free packaged products had similar nutritional profiles to standard products, apart from for protein [226].
	Provision of supermarket own brand products	• Supermarket own brand products could not be described as nutritionally inferior to branded products [31]. • Mean sodium content of supermarket own brand products was 17% lower than for branded products from the same categories; it was lower for bread, desserts, biscuits, and processed meats; and higher for breakfast cereals. • There was a marked difference in mean sodium content of own brand products from different chains [30]. • Only supermarket own brand snack foods displayed the full Daily Intake Guide front of pack label [191].

Domain	Sub-domain	Findings
Price	Pricing strategy	• Food prices were generally cheaper in supermarket chains compared to independent supermarkets [89, 93]. • Fruits, vegetables and meat were slightly more expensive in supermarkets compared to independent stores [223, 224]. • Online supermarket prices were higher than in-store prices [194].
	Sensitivity and elasticity	-
	Price promotions	-
Placement	In-store location	• Snack foods were prominent at checkouts [82, 83], and few displayed the foods or drinks out of the reach of children [83]. • None of the supermarkets displayed fruit at checkouts, and only one store displayed vegetables [83].
	Shelf location	• The mean total aisle length of snack foods was 45.8m in Australian supermarkets [14]. Supermarket island bin displays added a median of 19.4m snack foods display space [530]. • The prominence of snack foods did not differ by supermarket area level of socio-economic disadvantage, but amount shelf space for snack foods did [15, 82]. For fruits and vegetables, the amount of shelf space did not differ by supermarket area level of socio-economic disadvantage [15].
Promotions	Health messages	• A large proportion of packaged products had at least one type of health or nutrition claim [199], including many child-orientated products [86].
	Promotions targeting children	• Most foods designed to appeal to children are unhealthy [17, 85, 86]. • Sixteen techniques were identified that promote packaged foods to children, including graphics, cartoons, and celebrities, with an average of six techniques per product [86]. • Parents would like confectionery-free checkouts, minimal child orientated product placement, and a reduction in children's general exposure to food marketing [84]
	Other promotions	• None of the supermarkets promoted snack foods outside of the stores [83].

Appendix C Supplementary material for Publication #3: The extent and nature of supermarket own brand foods in Australia: study protocol for describing the contribution of selected products to the healthfulness of food environments

Table App 7.4 Completed SPIRIT 2013 Checklist: Recommended items to address in a clinical trial protocol and related documents*

Section/item	ItemNo	Description	Completed
Administrative information			
Title	1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	Yes
Trial registration	2a	Trial identifier and registry name. If not yet registered, name of intended registry	n/a
	2b	All items from the World Health Organization Trial Registration Data Set	n/a
Protocol version	3	Date and version identifier	n/a
Funding	4	Sources and types of financial, material, and other support	Yes
Roles and responsibilities	5a	Names, affiliations, and roles of protocol contributors	Yes
	5b	Name and contact information for the trial sponsor	n/a
	5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	Yes
	5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	n/a
Introduction			
Background and rationale	6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	Yes

Section/item	ItemNo	Description	Completed
		Explanation for choice of comparators	n/a
Objectives	7	Specific objectives or hypotheses	Yes
Trial design	8	Description of trial design including type of trial (e.g., parallel group, crossover, factorial, single group), allocation ratio, and framework (e.g., superiority, equivalence, noninferiority, exploratory)	Yes
Methods: Participants, interventions, and outcomes			
Study setting	9	Description of study settings (e.g., community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained	Yes
Eligibility criteria	10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (e.g., surgeons, psychotherapists)	n/a
Interventions	11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	n/a
	11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (e.g., drug dose change in response to harms, participant request, or improving/worsening disease)	n/a
	11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (e.g., drug tablet return, laboratory tests)	n/a
	11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	n/a

Section/item	ItemNo	Description	Completed
Outcomes	12	Primary, secondary, and other outcomes, including the specific measurement variable (e.g., systolic blood pressure), analysis metric (e.g., change from baseline, final value, time to event), method of aggregation (e.g., median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	Yes
Participant timeline	13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended	n/a
Sample size	14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	n/a
Recruitment	15	Strategies for achieving adequate participant enrolment to reach target sample size	n/a
Methods: Assignment of interventions (for controlled trials)			
Allocation:			
Sequence generation	16a	Method of generating the allocation sequence (e.g., computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (e.g., blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions	n/a
Allocation concealment mechanism	16b	Mechanism of implementing the allocation sequence (e.g., central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	n/a

Section/item	ItemNo	Description	Completed
Implementation	16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	n/a
Blinding (masking)	17a	Who will be blinded after assignment to interventions (e.g., trial participants, care providers, outcome assessors, data analysts), and how	n/a
Blinding (masking)	17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	n/a
Methods: Data collection, management, and analysis			
Data collection methods	18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (e.g., duplicate measurements, training of assessors) and a description of study instruments (e.g., questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol	Yes
	18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	n/a
Data management	19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (e.g., double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	Yes
Statistical methods	20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	Yes
	20b	Methods for any additional analyses (e.g., subgroup and adjusted analyses)	n/a

Section/item	ItemNo	Description	Completed
	20c	Definition of analysis population relating to protocol non-adherence (e.g., as randomised analysis), and any statistical methods to handle missing data (e.g., multiple imputation)	n/a
Methods: Monitoring			
Data monitoring	21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	n/a
	21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	n/a
Harms	22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	n/a
Auditing	23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	n/a
Ethics and dissemination			
Research ethics approval	24	Plans for seeking research ethics committee/institutional review board (REC/IRB) approval	n/a
Protocol amendments	25	Plans for communicating important protocol modifications (e.g., changes to eligibility criteria, outcomes, analyses) to relevant parties (e.g., investigators, REC/IRBs, trial participants, trial registries, journals, regulators)	n/a

Section/item	ItemNo	Description	Completed
Consent or assent	26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	n/a
	26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	n/a
Confidentiality	27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	n/a
Declaration of interests	28	Financial and other competing interests for principal investigators for the overall trial and each study site	n/a
Access to data	29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	n/a
Ancillary and post-trial care	30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	n/a
Dissemination policy	31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (e.g., via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	Yes
	31b	Authorship eligibility guidelines and any intended use of professional writers	n/a
	31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	Yes
Appendices			
Informed consent materials	32	Model consent form and other related documentation given to participants and authorised surrogates	n/a

Section/item	ItemNo	Description	Completed
Biological specimens	33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	n/a

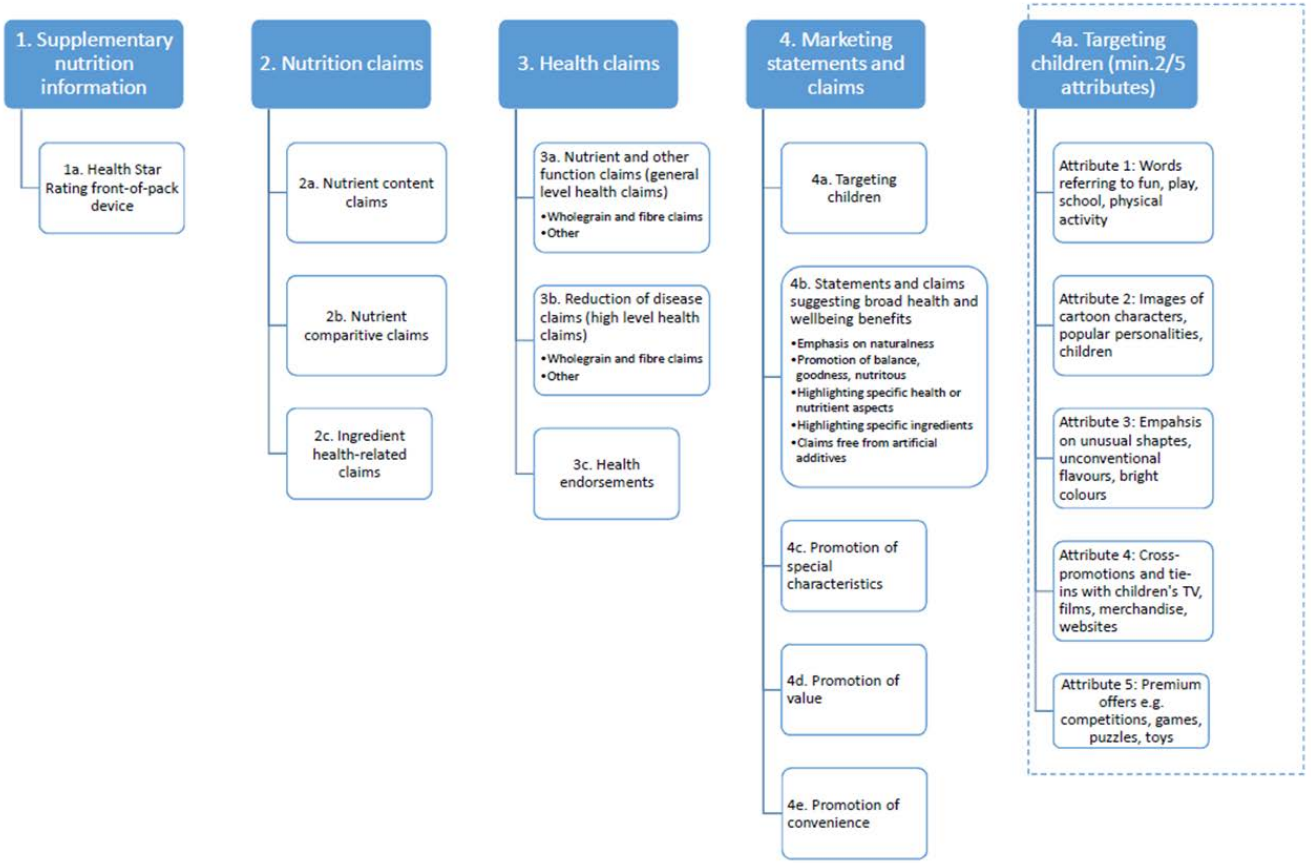
Table App 7.5 Food groups and product groups for classifying supermarket own brand foods

Food group	Product groups
#1 Bakery and desserts	Biscuits and slices
	Bread and alternatives
	Cakes and pastries
	Desserts
	Ice cream cones and toppings
	Savoury biscuits/ snacks
#2 Beverages	Carbonated drinks
	Chilled juice
	Cordial
	Fruit drink
	Long-life juice
	Water
#3 Chilled convenience	Chilled antipasto and dips
	Chilled dressed salads
	Chilled garlic bread and naan
	Chilled meals
	Chilled pasta and sauce
	Chilled pizza
	Chilled quiche and pies
	Chilled soup
	Prepared vegetables
	Vegetarian
	Sauces and salad dressing
	Salad kits and bowls
#4 Frozen food	Frozen baking ingredients
	Frozen desserts
	Frozen fish
	Frozen fruit
	Frozen hand held ices
	Frozen meals
	Frozen meat
	Frozen party food
	Frozen pizza
	Frozen potatoes
	Frozen vegetables
	Ice cream
#5 Dairy	Butter and margarine
	Cheese
	Dairy desserts
	Dairy snacks
	Eggs
	Gourmet cheese
	Long-life milk and cream
	Milk and cream
	Yogurt

Food group	Product groups
#6 Processed meat	Bacon/ ham
	Burgers/ rissoles
	Canned meat
	Chilled sauces and marinades
	Sausages and meatballs
	Cured meat
	Sliced/ processed meat
	Other
#7 Prepared meat	Prepared beef
	Prepared chicken
	Prepared lamb
	Prepared pork
#8 Processed fish	Canned tuna
	Canned salmon
	Smoked fish
	Other fish
#9 Processed fruit, veg, legumes	Canned/jar veg
	Canned fruit
	Canned legumes
	Canned pasta in sauce
	Dehydrated veg
	Vegetable pouch
	Fruit cup/ fruit tub
	Fruit pouch
#10 Rice, pasta, noodles, cereal, other grains	Breakfast cereals
	Canned rice
	Legumes
	Instant meals
	Liquid breakfast
	Other grains and seeds
	Pasta
	Rice
#11 Snacks, crisps, nuts	Crisps and chips
	Nuts
	Nut snacks
	Popcorn
	Salsa
	Snack bars/ snack pots
#12 Dried fruit	Dried fruit
	Dried fruit snacks
	Fruit and nut mix
#13 Confectionery	Sugar confectionery
	Chocolate
	Chocolate coated confectionery

Food group	Product groups
#14 Soups, sauces, condiments	Canned soup
	Condiments
	Gravy
	Packet soup
	Sauces
	Soup pouch
	Stock
#15 Baby	Baby food
	Infant formula
#16 Baking ingredients	Baking ingredients
	Cake mixes
	Biscuit mixes
	Pancake mixes
	Cake toppings
	Cooking chocolate
	Custard
	Flour
	Sugar and syrups
#17 Prepacked fresh food	Prepacked beef
	Prepacked chicken
	Prepacked fish
	Prepacked fruit
	Prepacked herbs/ seasoning
	Prepacked lamb
	Prepacked pork
	Prepacked mixed meat
	Prepacked salads
	Prepacked veg
#18 Other grocery	Coffee
	Herbs and spices
	Hot chocolate
	Jams and spreads
	Long-life meals
	Oil
	Salad dressing
	Salt and seasoning
	Sugar and sweeteners
	Tea
	Vinegar
	Other grocery

Figure App 7.1 Taxonomy of nutrition and health related packaging information[#]



[#]Adapted from the INFORMAS food labelling taxonomy [313], Mayhew *et al.*'s definitions of marketing techniques promoting health and wellbeing [314]; and Mehta and colleagues' work defining food packaging targeting children [86]

Appendix D Supplementary material for Publication #5: The impact of corporate social responsibility on Australian parents' ability to select healthy foods: a qualitative study

Table App 7.6 Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist [386]

No	Item	Guide questions/description	Response
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Facilitator	Which author/s conducted the interview or focus group?	Employed facilitator
2.	Credentials	What were the researcher's credentials?	Experienced qualitative researcher
3.	Occupation	What was their occupation at the time of the study?	Market researcher
4.	Gender	Was the researcher male or female?	Female
5.	Experience and training	What experience or training did the researcher have?	20 years' experience
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	Not relevant
7.	Participant knowledge of the interviewer	What did the participants know about the researcher?	Not relevant
8.	Interviewer characteristics	What characteristics were reported about the facilitator?	None
Domain 2: Study design			
Theoretical framework			
9.	Methodological orientation and theory	What methodological orientation was stated to underpin the study?	Inductive content analysis
Participant selection			
10.	Sampling	How were participants selected?	Purposive
11.	Method of approach	How were participants approached?	Telephone
12.	Sample size	How many participants were in the study?	37
13.	Non-participation	How many people refused to participate or drop out?	None
Setting			
14.	Setting of data collection	Where was the data collected?	Market research facilities
15.	Presence of non-participants	Was anyone else present apart from the participants and researchers?	No
16.	Description of sample	What are the important characteristics of the sample?	See Table 2
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	See Table 3

No	Item	Guide questions/description	Response
18.	Repeat interviews	Were repeat interviews carried out? If so, how many?	Not relevant
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Yes
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Not relevant
21.	Duration	What was the duration of the interviews or focus group?	90 minutes
22.	Data saturation	Was data saturation discussed?	Yes
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: Analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	2
25.	Description of the coding tree	Did authors provide a description of the coding tree?	No
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Inductively derived
27.	Software	What software, if applicable, was used to manage the data?	NVivo11
28.	Participant checking	Did participants provide feedback on the findings?	No
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified?	Yes
30.	Data and findings consistent	Was there consistency between data presented and the findings?	Yes
31.	Clarity of major themes	Were major themes clearly presented in the findings?	7 major themes presented
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Minor themes are not presented separately

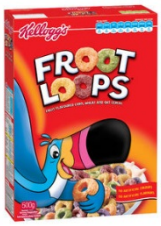
Figure App 7.2 Food items used as stimuli for focus groups

(1)

(2)

(3)

(4)



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(25)

Footnote: Images were sourced from supermarket online shopping websites or food manufacturer websites.

Appendix E Supplementary material for Publication #6: Alignment of supermarket own brand foods' front-of-pack nutrition labelling with measures of nutritional quality: An Australian perspective

Figure App 7.3 Front-of-pack nutrition labels present in Australia

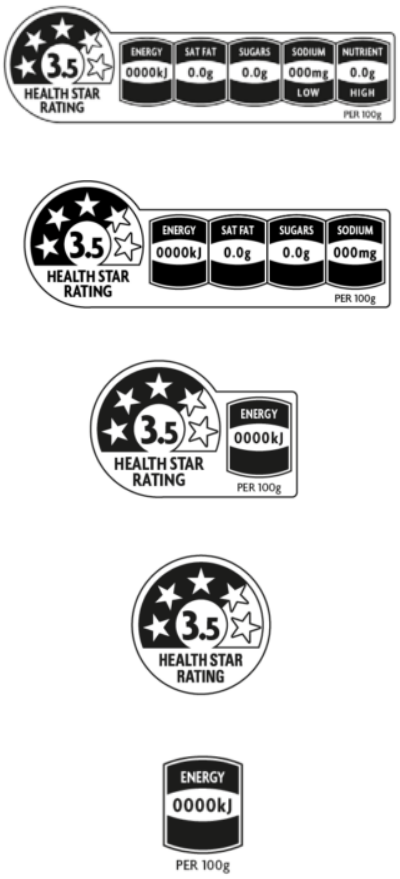
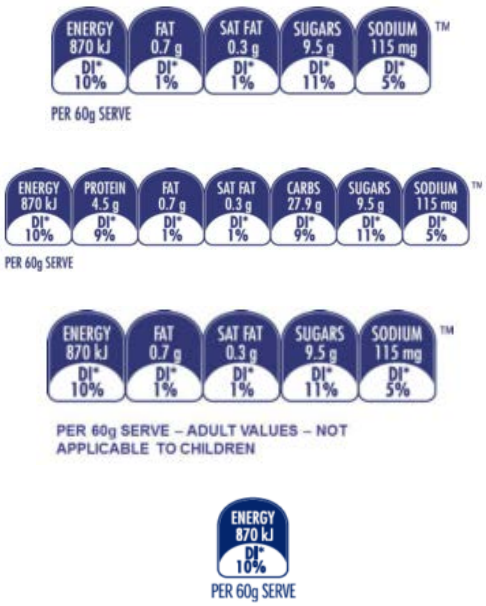
 **The different options for displaying the Health Star Rating system graphic**	**Positive attributes:** Protein Dietary fibre Fruit, vegetable, nut and legume content Calcium – for dairy beverages and dairy foods **Negative attributes:** Energy Saturated fat Total sugar Sodium **Nutrients and ingredients that are included in the Health Star Rating algorithm**
 **The options for displaying the Daily Intake Guide**	**Core nutrients:** Fat Saturated fat Total sugar Sodium **Optional nutrients:** Protein Carbohydrate **Nutrients recommended for display in the Daily Intake Guide**

Figure App 7.4 The research process

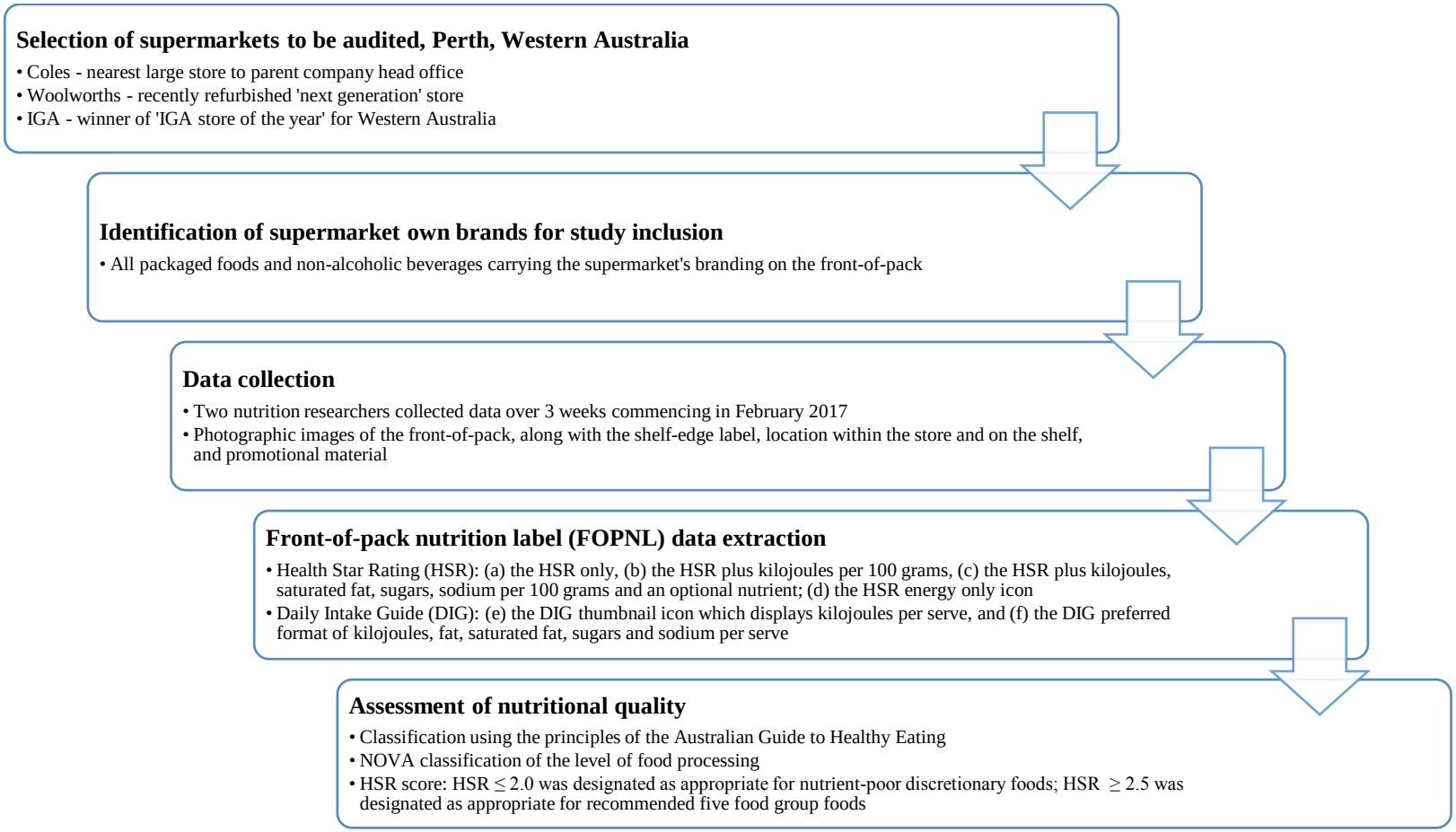


Table App 7.7 Procedure to classify foods consistent with the Australian Guide to Healthy Eating

Question	Details	If yes…	If no or unsure…
Q1. Is the product easily identifiable as a five food group food, or water?	Vegetables - All fresh, frozen, canned and dried, but not fried Fruit - All fresh, frozen, canned, dried, and fruit juice Grains - Whole and rolled grains, flour, bread, pasta, noodles, breakfast cereals, including refined and whole grain varieties Lean meat, fish, and alternatives - All fresh, frozen and canned meat, poultry and fish; salt and fat reduced sausages; eggs, tofu, nuts and nut spreads, legumes, seeds Milk, yoghurt, cheese, and alternatives - Fresh, dried, evaporated or UHT milk, yoghurt, all cheese, and calcium-enriched alternatives Water	Classify into the appropriate food group	Go to Q2
Q2. Is the product easily identifiable as a discretionary food, using the examples provided in the Eat for Health Educators Guide?	Foods with higher added sugars - energy drinks, fruit drinks, honey, jams, marmalade, some sauces, sports drinks, sugar, confectionery, soft drinks, cordials, sweetened waters, iced tea, syrups Foods with higher saturated fat - bacon, ham, butter, cream, ghee, some tacos/nachos/enchiladas, commercially fried foods, commercial burgers, crisps, extruded snacks, dairy blends, frankfurts, chips, meat pie, pasties, pastry, pizza, processed meat, quiche, salami, mettwurst, sausages, some crackers, some sauces, spring roll Foods with higher saturated fat and added sugars - biscuits, cakes, chocolate, chocolate bars, dessert style custards, doughnuts, iced buns, ice cream, muesli bars, puddings, slices, some confectionery, some sauces, muffins, pastries, pies, crumbles	Classify as discretionary	Go to Q3

Question	Details	If yes…	If no or unsure…
Q2 (continued)	Foods with high salt - marinades and sauces e.g. fish sauce, soy sauce; salty snack foods; spreads e.g. Vegemite; savoury biscuits	Classify as discretionary	Go to Q3
Q3. Do the ABS principles for identifying discretionary foods identify this food as discretionary?	All milk drinks including flavoured milk	Classify as milk, yoghurt, cheese and alternatives	
	All soft drinks including those with intense sweeteners	Classify as discretionary	
	All fruit drinks other than fruit juices		
	Tea or coffee with added sugar		
	Breakfast cereals without added fruit > 30g sugar/100g		
	Breakfast cereals with added fruit > 35g sugar/100g		
	All dry soup mixes		
	Mixed dishes containing grains e.g. sandwiches, burgers, wraps, sushi, pizza >5g saturated fat/100g	Classify as ‘mixed product high in fat salt or sugar’	
Q4. Does the product contain any of the following: added saturated fat, added salt, or added sugar?	added saturated fat e.g. butter, cream, coconut milk/cream, mayonnaise	Go to Q5	Classify as 'mixed product using mainly five food group foods'
	added salt e.g. marinades, soy/fish sauce, stock/bouillon		
	added sugar or other sweeteners e.g. honey, syrups		
Q5. Does the nutrition content of the product meet any of the following criteria from the Eat for Health Educators Guide?	-- total fat > 10g per 100g	Classify as discretionary or 'mixed product high in fat salt or sugar'	Go to Q6
	-- saturated fat > 3g per 100g		
	-- total sugar > 15g per 100g		
	-- sodium > 400mg per 100g		

Question	Details	If yes…	If no or unsure…
Q6. Is there enough information provided to classify the product as five food group foods or mixed product using mainly core foods?	For products where only front-of-pack information is available, products will be classified as discretionary/ mixed product high in fat salt or sugar unless there is sufficient information to classify it as five food group food/ mixed product using mainly five food group foods	Classify into the appropriate food group, or as 'mixed product using mainly five food group foods'	Classify as discretionary or 'mixed product high in fat salt or sugar'

Appendix F Appendix F Supplementary material for Publication #8: The nature and quality of Australian supermarkets' policies which can impact public health nutrition and evidence of practical application: a cross-sectional study

Table App 7.8 Supermarket own brands present on foods and non-alcoholic beverages in three Australian supermarkets

Supermarket own brand present	Frequency	Percent
Coles own brands		
Coles	1482	85.6%
The Bakery at Coles	93	5.4%
Coles Simply Gluten Free	47	2.7%
Coles Organic	28	1.6%
Coles Smart Buy	22	1.3%
Coles Finest	14	0.8%
Coles Grill	12	0.7%
Coles Simply	11	0.6%
Coles Make at Home	8	0.5%
Coles Bake at Home	7	0.4%
Coles Gluten Free	4	0.2%
Coles Simply Less	3	0.2%
Total Coles audited products	***1731***	
Woolworths own brands		
Woolworths Select	631	34.8%
Woolworths	506	27.9%
Woolworths Homebrand	153	8.4%
Macro Organic	114	6.3%
Macro	81	4.5%
Woolworths in-store bakery label	80	4.4%
Woolworths Essentials	54	3.0%
Woolworths Gold	46	2.5%
Woolworths Free From	32	1.8%
Woolworths Created with Jamie	15	0.8%
Jamie Oliver	14	0.8%
Macro Free Range	14	0.8%
Baby Macro Organic	12	0.7%
Woolworths Market Value	12	0.7%
Woolworths Delicious Nutritious	10	0.6%
Woolworths The Odd Bunch	8	0.4%
Woolworths Simply Roast	7	0.4%
Woolworths Select Once Upon a Time	6	0.3%
Farmer's Own	5	0.3%
Mini Macro	4	0.2%
Woolworths Simply Heat	4	0.2%
Gold	1	0.1%
Macro Grass Fed	1	0.1%
Woolworths Simply Cook	1	0.1%
Woolworths Simply Stir-fry	1	0.1%
Total Woolworths audited products	***1812***	
IGA own brands		
Black & Gold	273	68.8%
SUPA IGA	49	12.3%
IGA Baker's Oven	38	9.6%
IGA Signature	24	6.0%
Community Co	12	3.0%
IGA Signature AWARE	1	0.3%
Total IGA audited products	***397***	